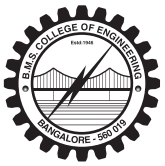

ಬಿ.ಎಂ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ

(ಸ್ವಾಯತ್ತ ವಿದ್ಯಾ ಸಂಸ್ಥೆ)

BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU)

TELECOMMUNICATION ENGINEERING

SCHEME & SYLLABUS FOR
AUTONOMUS COURSE
2010 - 2011Batch
&
2011 - 2012Batch

ಬಿ.ಎಂ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ

ಬುಲ್ ಟೆಂಪಲ್ ರಸ್ತೆ, ಬೆಂಗಳೂರು–560 019

BMS COLLEGE OF ENGINEERING

Bull Temple Road, Bangalore - 560 019

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BMS COLLEGE OF ENGINEERING, BANGALORE-19

Autonomous College under VTU

Program: TELECOMMUNICATION ENGINEERING **Semester: I**

Course Code	CourseTitle	Hours/Week			Credits	CIE	SEE	Total
		L	T	P				
09MAT1ICMAT	Engineering Mathematics-I	3	2	0	4	50	50	100
09CHY1ICCHY	Engineering Chemistry	4	0	2	5	50	50	100
08EC1ICEEE	Elements of Electronics Engineering	4	0	0	4	50	50	100
09CS1ICCCP	Computer Concepts and C Programming	4	O	2	5	50	50	100
09ME1ICCAD	Computer Aided Engineering Drawing	2	O	4	4	50	50	100
08HS1ICEVS	Environmental Studies	2	O	0	2	50	50	100
08HS1ICCIP	Constitution of India & Professional Ethics	2	O	0	2	50	50	100
Total					26	350	350	700

BMS COLLEGE OF ENGINEERING, BANGALORE-19

Autonomous College under VTU

GSemester: IProgram: TELECOMMUNICATION ENGINEERING **Semester: II**

Course Code	CourseTitle	Hours/Week			Credits	CIE	SEE	Total
		L	T	P				
09MA2ICMAT	Engineering Mathematics -II	3	2	0	4	50	50	100
09PY2ICPHY	Engineering Physics	4	0	2	5	50	50	100
08EE2ICBEE	Basic Electrical Engineering	4	0	0	4	50	50	100
08ME2ICEME	Elements of Mechanical Engineering	4	0	0	4	50	50	100
09CV2ICENM	Engineering Mechanics	4	0	0	4	50	50	100
09ME2ILWSP	Workshop Practice	0	0	1	1	50	50	100
09HS2ICPDC	Personality development and communication skills	2	0	0	2	50	50	100
08HS2IMKAN	Kannada Language	2	0	0	0	50	–	50
08HS2IMENG	Functional English	2	0	0	0	50	–	50
Total					24	450	350	800

BMS COLLEGE OF ENGINEERING, BANGALORE-19
Autonomous College under VTU

Program: Electrical Cluster (EE/EC/TC/ML/IT) **Semester: III**

Course Code	CourseTitle	Hours/Week			Credits	CIE	SEE	Total
		L	T	P				
11MA3ICMAT	Engineering Mathematics-III	3	2	0	4	50	50	100
10ES3GCNAL	Network Analysis	4	0	0	4	50	50	100
11ES3GCAEC	Analog Electronic Circuits	4	0	2	5	50	50	100
11ES3GCDEC	Digital Electronics	4	0	2	5	50	50	100
11ES3GCSAS	Signals & Systems (EC/EE/IT)	4	0	0	4	50	50	100
11TC3GCASP	Analog Signal Processing (TC)							
11ES3GCMDS	Medical Science (ML)							
10ES3GCEIM	Electronic Instrumentation and Measurements (EC/TC)	3	0	0	3	50	50	100
09ES3GCMST	Measurement Techniques (EE/IT/ML)							
Total		**22**	**2**	**4**	**25**	**300**	**300**	**600**

GE- Group Elective **L –** Lecture Hours / week; **T-** Tutorial Lecture Hours / week; **P-**Practical Lecture Hours / week.
CIE- Continuous Internal Evaluation; **SEE-** Semester End Examination (of 3 Hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE-19
Autonomous College under VTU

Program: Electrical Cluster (EE/EC/TC/ML/IT) **Semester: IV**

Course Code										CourseTitle	Hours/Week			Credits	CIE	SEE	Total
											L	T	P				
1	1	M	A	**4**	I	C	M	A	T	Engineering Mathematics-IV	3	2	0	4	50	50	100
1	1	E	S	**4**	G	C	L	I	C	Op-amps and Linear Ics	4	0	2	5	50	50	100
1	1	E	S	**4**	G	C	M	C	S	Microcontrollers	3	0	2	4	50	50	100
1	1	E	S	**4**	G	C	F	T	H	Field Theory (EC/EE/IT/TC)	4	0	0	4	50	50	100
							S	A	S	Signals & Systems (ML)							
0	9	E	S	**4**	G	C	C	S	T	Control Systems	4	0	0	4	50	50	100
0	9	E	S	**4**	G	C	H	D	L	Fundamentals of HDL (EC/TC/ML/IT)	3	0	2	4	50	50	100
1	1		E		D		T	I	M	Transformers and Induction Machines (EE)							
Total											**21**	**2**	**6**	**25**	**300**	**300**	**600**

GE- Group Elective **L –** Lecture Hours / week; **T-** Tutorial Lecture Hours / week; **P-**Practical Lecture Hours / week.
CIE- Continuous Internal Evaluation; **SEE-** Semester End Examination (of 3 Hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE-19
Autonomous College under VTU

Program: TELECOMMUNICATION ENGINEERING **Semester: V**

Course Code	CourseTitle	L	T	P	Credits	Marks		
						CIE	SEE	Total
11TC5DCDTS	Discrete time signal processing	4	0	2	5	50	50	100
10TC5DCACM	Analog Communication	4	0	2	5	50	50	100
10TC5DCDSS	Digital Switching Systems	3	0	0	3	50	50	100
10TC5DCVLI	Fundamentals of CMOS VLSI	4	0	0	4	50	50	100
12TC5DCDSA	DSP Algorithms and Architecture	3	0	2	4	50	50	100
XXXX5GE1XX	Group-I Electrical Cluster Elective	4 3	0 0	0 2	4	50	50	100
Total		22 21	0	6 8	**25**	**300**	**300**	**600**

DC- Department Core , **GC-** Group Core, **GE-** Group Elective; **L –** Lecture Hours / week; **T-** Tutorial Lecture Hours / week; **P-**Practical Lecture Hours/week. **CIE-** Continuous Internal Evaluation; **SEE-** Semester End Examination (of 3 Hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE-19
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Program: TELECOMMUNICATION ENGINEERING **Semester: VI**

Course Code										CourseTitle	L	T	P	Credits	Marks		
															CIE	SEE	Total
1	0	T	C	6	D	C	D	C	M	Digital Communication	4	0	2	5	50	50	100
1	0	T	C	6	D	C	T	L	A	Transmission Lines & Antennas	4	0	0	4	50	50	100
1	1	T	C	6	D	C	C	C	N	Computer Communication Networks	4	0	0	4	50	50	100
1	0	T	C	6	D	C	I	T	C	Information Theory & Coding	4	0	0	4	50	50	100
X	X	X	X	6	G	E	2	X	X	Group-II Electrical Cluster Elective	4 3	0 0	0 2	4	50	50	100
X	X	X	X	6	G	E	3	X	X	Group-III Electrical Cluster Elective	4 3	0 0	0 2	4	50	50	100
Total											21 22 23	0	8 6 4	**25**	**300**	**300**	**600**

DC- Department Core , **GC-** Group Core, **GE-** Group Elective; **L –** Lecture Hours / week; **T-** Tutorial Lecture Hours / week; **P-**Practical Lecture Hours/week. **CIE-** Continuous Internal Evaluation; **SEE-** Semester End Examination (of 3 Hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE-19

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Program: TELECOMMUNICATION ENGINEERING **Semester: VII**

Course Code										CourseTitle	L	T	P	Credits	Marks		
															CIE	SEE	Total
1	1	T	C	7	D	C	M	W	R	Microwave & Radar	3	0	0	3	50	50	100
1	1	T	C	7	D	C	O	F	C	Optical Fiber Communication	3	0	0	3	50	50	100
1	1	T	C	7	D	C	W	C	M	Wireless Communication	3	0	2	4	50	50	100
X	X	X	X	7	G	E	4	X	X	Group-IV Electrical Cluster Elective	4	0	0	4	50	50	100
											3	0	2				
X	X	X	X	7	G	E	5	X	X	Group-V Electrical Cluster Elective	4	0	0	4	50	50	100
											3	0	2				
1	1	X	X	7	I	E	1	X	X	Group-I Institute Elective	4	0	0	4	50	50	100
											3	0	2				
1	1	E	S	7	D	C	P	W	1	Project work -I	0	0	6	4	50	50	100
Total											20-23	0	20-23	26	350	350	700

BMS COLLEGE OF ENGINEERING, BANGALORE-19

Autonomous College under VTU

Program: TELECOMMUNICATION ENGINEERING **Semester: VIII**

Course Code										CourseTitle	L	T	P	Credits	CIE	SEE	Total
1	1	H	S	8	G	C	I	P	R	Intellectual Property Rights	2	0	0	2	50	50	100
1	1	H	S	8	G	C	P	R	M	Project Management	2	0	0	2	50	50	100
1	1	X	X	8	I	E	2	X	X	Group-II Institute Elective	4	0	0	4	50	50	100
1	1	T	C	8	D	C	S	M	R	Seminar	0	4	0	2	50	50	100
1	1	E	S	8	D	C	P	W	2	Project Work - II	0	0	21	14	100	100	200
										Total				**24**	**300**	**300**	**600**

DC- Department Core , **GC-** Group Core, **GE-** Group Elective; **L –** Lecture Hours / week; **T-** Tutorial Lecture Hours / week; **P-**Practical Lecture Hours/week. **CIE-** Continuous Internal Evaluation; **SEE-** Semester End Examination (of 3 Hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE-19

Autonomous College under VTU

Group I Electrical Cluster Electives (Programs: EC/TC/IT/EE/ML) **Semester: V**

Course Code										CourseTitle	Hours/Week			Credits	CIE	SEE	Total
											L	T	P				
1	2	E	S	5	G	E	1	0	P	Objected oriented programming using C++	4	0	0	4	50	50	100
1	2	E	S	5	G	E	1	D	D	Digital System Design using VHDL (Except EE)	3	0	2	4	50	50	100
1	2	E	S	5	G	E	1	I	T	Essentials of Information Technology	3	0	2	4	50	50	100
1	2	E	C	5	G	E	1	D	C	Digital Control of Dynamic Systems (Except IT)	4	0	0	4	50	50	100
1	2	M	L	5	G	E	1	M	P	Medical Physics	4	0	0	4	50	50	100
1	0	M	L	5	G	E	1	D	S	Data Structures with C++ (Except ML)	3	0	2	4	50	50	100
1	0	E	E	5	G	E	1	C	S	Communication Systems (EE only)	4	0	0	4	50	50	100
1	2	E	E	5	G	E	1	H	D	Fundamentals of HDL (EE only)	3	0	2	4	50	50	100

BMS COLLEGE OF ENGINEERING, BANGALORE-19

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Group II Electrical Cluster Electives (Programs: EC/TC/IT/EE/ML) **Semester: VI**

Course Code										CourseTitle	Hours/Week			Credits	CIE	SEE	Total
											L	L	L				
1	0	E	E	6	G	E	2	F	V	Fundamentals of VLSI (EE only)	4	0	0	4	50	50	100
1	0	E	E	6	G	E	2	U	P	Utilization of Electrical Power	4	0	0	4	50	50	100
1	2	E	S	6	G	E	2	O	S	Operating Systems Concepts	4	0	0	4	50	50	100
1	2	E	S	6	G	E	2	M	C	Advanced Microcontroller and Applications	3	0	2	4	50	50	100
1	0	T	C	6	G	E	2	S	A	Introduction to Speech and Audio Processing	3	0	2	4	50	50	100
1	2	T	C	6	G	E	2	C	J	Objected oriented programming using C++ & Java (Not for those who have taken 12ES5GE1OP)	4	0	0	4	50	50	100
1	0	M	L	6	G	E	2	S	N	Bio Sensors	4	0	0	4	50	50	100
1	0	M	L	6	G	E	2	B	S	Bio Statistics	4	0	0	4	50	50	100
1	0	I	T	6	G	E	2	M	D	Biomedical DSP (Except ML)	3	0	2	4	50	50	100
1	2	I	T	6	G	E	2	M	T	MEMS	4	0	0	4	50	50	100

BMS COLLEGE OF ENGINEERING, BANGALORE-19

Autonomous College under VTU

Group III Electrical Cluster Electives (Programs: EC/TC/IT/EE/ML) **Semester: VI**

Course Code										CourseTitle	Hours/Week			Credits	CIE	SEE	Total
											L	L	L				
1	2	E	E	6	G	E	3	E	D	Embedded System Design	4	0	0	4	50	50	100
1	0	E	E	6	G	E	3	E	I	Electronic Instrumentation (EE only)	4	0	0	4	50	50	100
1	0	E	E	6	G	E	3	R	E	Renewable Energy Resources	4	0	0	4	50	50	100
1	0	T	C	6	G	E	3	R	T	Real Time Embedded Systems	4	0	0	4	50	50	100
1	2	E	C	6	G	E	3	A	E	Automotive Embedded Systems Development Technology	4	0	0	4	50	50	100
1	2	E	S	6	G	E	3	I	P	Fundamentals of Image processing (Except ML)	3	0	2	4	50	50	100
1	0	T	C	6	G	E	3	M	M	Design of Analog and Mixed mode VLSI circuits (Only TC)	4	0	0	4	50	50	100
1	2	M	L	6	G	E	3	B	C	Biomedical circuits with VLSI	4	0	0	4	50	50	100
1	0	M	L	6	G	E	3	R	E	Rehabilitation Engineering	4	0	0	4	50	50	100
1	0	I	T	6	G	E	3	R	B	Robotics	4	0	0	4	50	50	100
1	2	I	T	6	G	E	3	O	I	Optical Instrumentation I	4	0	0	4	50	50	100

BMS COLLEGE OF ENGINEERING, BANGALORE-19

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Group IV Electrical Cluster Electives (Programs: EC/TC/IT/EE/ML) **Semester: VII**

Course Code										CourseTitle	Hours/Week			Credits	CIE	SEE	Total
											L	L	L				
1	1	E	E	7	G	E	4	P	S	Power Systems Operation and Control	4	0	0	4	50	50	100
1	1	E	E	7	G	E	4	I	D	Industrial Drives and Applications	4	0	0	4	50	50	100
1	2	T	C	7	G	E	4	M	C	Low power Microcontroller *(Except ML)*	3	0	2	4	50	50	100
1	1	T	C	7	G	E	4	S	R	Software Defined Radio (only EC, TC)	4	0	0	4	50	50	100
1	2	E	S	7	G	E	4	M	C	Multimedia Communication	3	0	2	4	50	50	100
1	2	M	L	7	G	E	4	B	M	Biometrics	4	0	0	4	50	50	100
1	2	M	L	7	G	E	4	A	V	Introduction to Audio & Video processing	4	0	0	4	50	50	100
1	1	E	C	7	G	E	4	W	C	Wireless communication *(Except TC)*	4	0	0	4	50	50	100
1	1	E	C	7	G	E	4	E	S	Embedded Systems Design	4	0	0	4	50	50	100
1	1	I	T	7	G	E	4	D	C	Distributed Computing	4	0	0	4	50	50	100
1	1	I	T	7	G	E	4	M	I	Medical Imaging Systems (Except ML)	4	0	0	4	50	50	100

BMS COLLEGE OF ENGINEERING, BANGALORE-19

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Group V Electrical Cluster Electives (Programs: EC/TC/IT/EE/ML) **Semester: VII**

Course Code										CourseTitle	Hours/Week			Credits	CIE	SEE	Total
											L	L	L				
1	2	E	E	7	G	E	5	P	Q	Electrical Power Quality	4	0	0	4	50	50	100
1	1	E	E	7	G	E	5	S	P	Switch Mode Power Supplies	4	0	0	4	50	50	100
1	1	T	C	7	G	E	5	E	M	EMC -EMI	4	0	0	4	50	50	100
1	1	T	C	7	G	E	5	S	C	Satellite Communication	4	0	0	4	50	50	100
1	1	E	S	7	G	E	5	A	D	ASIC Design	4	0	0	4	50	50	100
1	1	M	L	7	G	E	5	I	P	Advanced Medical Image Processing	4	0	0	4	50	50	100
1	1	M	L	7	G	E	5	S	P	Advanced Biomedical Digital Signal Processing	4	0	0	4	50	50	100
1	1	E	C	7	G	E	5	N	S	Network Security	4	0	0	4	50	50	100
1	1	E	C	7	G	E	5	L	P	Low Power VLSI design	4	0	0	4	50	50	100
1	1	I	T	7	G	E	5	E	S	Embedded System and RTOS	4	0	0	4	50	50	100
1	1	I	T	7	G	E	5	C	N	Computer Communication Networks (Except TC & EC)	4	0	0	4	50	50	100

BMS COLLEGE OF ENGINEERING, BANGALORE-19

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Program:INSTRUMENTATIONTECHNOLOGY

Summary categorizationofCoursesOffered(CreditDistribution)

Sem	Humanitie Science	Basic Science	Engineering Science	Professional Core	Professional Elective	Institution Elective	Project	Seminar	Total
I	04	9	13	-	-	-	-	-	26
I	02	9	13	-	-	-	-	-	24
I	-	04	-	21	-	-	-	-	25
IV	-	08	04	13	-	-	-	-	25
V	-	-	-	21	04	-	-	-	25
VI	-	-	-	17	08	-	-	-	25
VII	-	-	-	10	08	04	04	-	26
VIII	04	-	-	-	-	04	14	02	24
Course Total	10	30	30	82	20	08	18	02	200

B.M.S COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU)

Program Vision

Establish an identity for the department on the world map of Telecommunication Engineering Education

Program Mission

To achieve the Vision through:

- Framing suitable curriculum
- Effective implementation of the framed curriculum
- Execute industry sponsored projects
- Pursue Research leading to International Journal/ Conference publications
- Provide due emphasis on Professional Ethics and Social/Environmental Concerns

PEOs

The four year Under-Graduate Telecommunication Engineering program develops the following skills in the student:

ability to apply knowledge of Mathematics and Science in Electronics & Telecommunication Engineering

ability to design, conduct and analyze experiments in the field of Electronics and Communication

ability to design communication modules considering power, bandwidth, cost, environment and safety

ability to work in multidisciplinary teams leading to improvement in team work and leadership qualities

ability to identify, formulate and solve problems in Electronics & Telecommunication Engineering

emphasize the need for professional and ethical responsibility ability to apply written, oral and graphical communication in both technical and non-technical environment

impart education to develop Engineering solutions with an awareness of global, economic, environmental and societal concerns

recognize the need for- and pursue life-long learning

acquire knowledge on continuously evolving Telecommunication Engineering products

ability to apply technical knowledge and use engineering tools necessary for engineering practice

B.M.S COLLEGE OF ENGINEERING, BANGALORE-19

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ENGINEERING MATHEMATICS – III
11MA3ICMAT

UNIT I

FOURIER SERIES **[09 hours]**

Infinite series, convergence and divergence of infinite series of positive terms, power series, periodic function, Dirichlet's conditions, statement of Fourier Theorem, Fourier series of periodic function of period 2 and arbitrary period, half range Fourier series, practical harmonic analysis. **[7 L + 2 T]**

UNIT II

FOURIER TRANSFORMS **[09 hours]**

Infinite Fourier transform, Fourier Sine and Cosine transforms, properties, Inverse transforms, Convolution theorem (statement only), Parseval's identities for Fourier transform. Fourier transforms of the derivatives of a function. **[7 L + 2 T]**

UNIT III

PARTIAL DIFFERENTIAL EQUATIONS **[12 hours]**

Formation of Partial differential equations-elimination of arbitrary constants, elimination of arbitrary functions. Equations of first order- The linear equation P p + Q q = R (Lagrange's partial differential equation). Method of separation of variables. **[5L+2T]**

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

One-dimensional heat equation and wave equation (without proof), various possible solutions of these by the method of separation of variables, D'Alembert's solution of wave equation.**[4L+1T]**

UNIT IV

NUMERICAL METHODS **[11 hours]**

Finite Differences and interpolation: Forward differences, Backwarddifferences.Interpolation: Newton-Gregory forward interpolation formula, Newton-Gregory backward interpolation formula, Lagrange's interpolation formula, Lagrange's inverse interpolation. Numerical differentiation: Numerical differentiation using Newton-Gregory forward and backward interpolation formula. **[4L+2T]**

Numerical integration: Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule. Solution of algebraic and transcendental equations: Newton-Raphson method, Numerical solution of ordinary differential equations: Euler's modified method, Runge-Kutta method of fourth order. **[4L+1T]**

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UNIT V

Z -TRANSFORMS **[11 hours]**

Definition, Properties, Transforms of standard functions, Inverse transforms.

APPLICATIONS OF Z-TRANSFORMS

Solution of difference equations using Z- transforms. **[5L+1T]**

CALCULUS OF VARIATIONS

Variation of function and functional, Euler's equation, variational problem.

APPLICATIONS OF CALCULUS OF VARIATIONS

Geodesics of a right circular cylinder, minimal surface of revolution, hanging chain, Brachistochrone problem. **[4L+1T]**

TEXT BOOKS:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 8th edition, 2007, Wiley-India
2. Higher Engineering Mathematics, B.S. Grewal, 40th edition, 2007, Khanna Publishers.
3. Introductory methods of Numerical Analysis, S. S. Sastry, 3rd edition, 1999, Prentice-Hall of India.

REFERENCE BOOKS:

1. Advanced Modern Engineering Mathematics, Glyn James, 3rd edition, 2004, Pearson Education.
2. Higher Engineering Mathematics, B.V. Ramana, 2007, Tata Mc. Graw Hill.
3. Advanced Engineering Mathematics, P. V. O'Neil, 5th Indian reprint, 2009, Cengage learning India Pvt. Ltd.
4. Advanced Engineering Mathematics, 3rd edition by Dennis G. Zill and Cullen, Jones and Bartlett India Pvt. Ltd..

Question Paper Pattern

1. Each unit consists of one full question with or without internal choice.
2. Internal choice may be there in maximum of two units.
3. Each full question consists of three or four subdivisions covering the entire syllabus of the Unit
4. One question to be answered in each Unit.

B.M.S COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU)

NETWORK ANALYSIS
10ES3GCNAL

Objective:

ability to design, conduct and analyze concept of circuit behavior with DC and AC sources

ability to design Resonant Circuit modules considering Frequency response of series and parallel circuits, Q factor, Bandwidth as the criteria.

ability to work in multiple teams to use Network Theorems such as Superposition, Thevinin's and Norton's on linear dependent and independent sources for discrete components/multisim/lab view software leading to improvement in team work and leadership qualities.

ability to identify, formulate and solve problems of R-L, R-C, R-L-C networks for AC and DC excitations using Laplace transforms.

Prerequisites:

09MA**1**ICMAT Engineering Mathematics –I
09MA**2**ICMAT Engineering Mathematics –II
08EC**1**ICEEE: Elements of Electronics Engineering
08EE**2**ICBEE Basic Electrical Engineering

UNIT I

Basic Concepts: **[08 hours]**

Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis with linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh.

UNIT II **[10 hours]**

Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie set, tie-set & cut-set schedules, Formulation of equilibrium equations, Principle of duality.

Resonant Circuits: Series and parallel resonance, frequency response of series and Parallel circuits, Q –factor, Bandwidth

UNIT III

Network Theorems : [12 hours]

Superposition, Reciprocity, Millman's, Thevinin's and Norton's theorems; Maximum Power transfer theorem

International Publications.

3. Theory and Problems of Electric Circuits (Schaum Series), 2nd Edition Mc Graw Hill

UNIT IV

Transient behavior and initial conditions: [12 hours]

Behavior of circuit elements under switching condition and their representation, evaluation of initial and final conditions in RL, RC and RLC circuits

Laplace Transformation & Applications

Review of Laplace transforms, waveform Synthesis, initial and final value theorems, step, ramp and impulse responses, convolution theorem, solution of simple R-L, R-C, RL- C networks for AC and DC excitations using Laplace transforms.

UNIT V

Two port network parameters: [10hours]

Definition of z, y, h and transmission parameters, modeling with these parameters, relationship between parameters sets.

TEXT BOOKS:

1. **"Network Analysis",** M. E. Van Valkenburg, PHI / Pearson Education, 3rd Editio Reprint 2002.
2. **"Networks and systems",** Roy Choudhury, 2nd edition, 2006 re-print, New A International Publications.
3. **Theory and Problems of Electric Circuits** (Schaum Series), 2nd Edition Mc Graw Hill

REFERENCE BOOKS:

1. **"Engineering Circuit Analysis",** Hayt, Kemmerly and Durbin,TMH 6th Editio 2002
2. **"Network analysis and Synthesis",** Franklin F. Kuo, Wiley
3. **"Analysis of Linear Systems",** David K. Cheng, Narosa Publishing House, 11 reprint, 2002
4. **"Circuits",** Bruce Carlson, Thomson Learning, 2000. Reprint 2002

ANALOG ELECTRONIC CIRCUITS
11ES3GCAEC

Objective:

ability to design, conduct and analyze experiments on Analog Electronic Circuits.
ability to design FET/BJT amplifier/oscillator modules considering stability as the criteria.
ability to work in multiple teams to perform analog experiments using discrete components/multisim software leading to improvement in team work and leadership qualities.
ability to identify, formulate and solve problems in any analog electronics domain.
ability to apply technical analysis and design knowledge of Analog Electronic Circuits for engineering applications.

Prerequisites:

08EC**1**ICEEE:	Elements of Electronics Engineering
09PY**2**ICPHY	Engineering Physics

UNIT I **[10 hours]**

Semiconductor Diodes – Semiconductor diode, ideal versus practical, resistance levels, diode equivalent circuits, transition and diffusion capacitance, reverse recovery time, diode specification sheets, semiconductor diode notation, diode testing.

Diode Applications – Introduction, load – line analysis, series diode configurations, parallel and series –parallel configurations, clippers, clampers, voltage multipliers.

UNIT II **[12 hours]**

DC biasing of BJTS – Introduction, operating point, fixed bias circuit, emitter bias, voltage divider bias, dc bias with voltage feedback, miscellaneous bias configurations, design operations, transistor switching networks, troubleshooting techniques, PNP transistors, bias stabilization.

BJT AC Analysis – Introduction, amplification in the ac domain, BJT transistor modeling, re transistor model, the hybrid equivalent model, CE fixed bias, voltage divider bias, CE emitter bias, Determining the current gain, Effect of RL and RS, two-port system approach, summary tables, complete hybrid equivalent model , problems on h parameters(only CE configuration)

UNIT III **[10 hours]**

Cascaded systems, Darlington connections, BJT frequency response – Introduction, logarithms, decibels, general frequency considerations, low frequency analysis – bode plot, BJT low frequency response, miller effect capacitance, BJT high frequency response

UNIT IV **[10 hours]**

Feedback Circuits (BJT version only)– Feedback concepts, feedback connection types, practical feedback circuits,

Power amplifiers – Introduction – definitions and amplifier types, series fed class A amplifier, transformer coupled class A amplifier, class B amplifier operation, class B amplifier circuits. Amplifier distortion, Power transistor heat sink, class C and class D amplifiers.

UNIT V **[10 hours]**

FETs – Introduction, construction and characteristics of JFETs, transfer characteristics, important relationships, JFET small signal model, JFET fixed bias, self bias, voltage divider configuration, JFET source follower, Depletion and Enhancement type

MOSFETS. UJT principle and characteristics

LAB Experiments: – Clipping, clamping, Bridge rectifiers, RC coupled amplifiers, Darlington emitter follower, RC phase shift & crystal oscillator, voltage series feedback amplifier, JFET static characteristics, UJT relaxation oscillator, Simulation experiments using Multisim/P-Spice

TEXT BOOK:

Electronic Devices and Circuit Theory- Boylestad and Louis Nashelsky, 9th edition - Pearson

REFERENCE BOOKS:

1. **Electronic Devices and Circuits-** Millman and Halkias, TMH
2. **Electronic Devices and Circuits-** David A Bell - PHI 4th edition

DIGITAL ELECTRONICS
11ES3GCDEC

Objective:

- Ability to apply knowledge of Mathematics through Boolean algebra and thereby design a digital system using laws.
- Ability to design an optimal solution for a given digital problem using K – Maps, QM – Technique which results in reduced number of gates and reduces the cost of the circuit.
- Ability to design combinational and sequential digital circuits for the given specifications and implement the same.
- Ability to apply technical knowledge and use engineering tools such as LabView / Multisim necessary for digital electronics practice.
- Ability to analyze the given state diagram or state table or state equation and develop the appropriate Mealy FSM or Moore FSM.
- Ability to debug the given digital system and derive the appropriate state diagram or state equation.

Prerequisites:

08EC**1**ICEEE Elements of Electronics Engineering

UNIT I [11 hours]

Introduction : Review of Boolean algebra, logic gates.

Simplification of Boolean functions : The Map Method, Two and Three Variable Maps, Four Variable Map, Five and Six variable Maps, Product of sums simplification, NAND and NOR implementation, Other Two level implementations, Don't care conditions, The Tabulation Method, Determination of Prime Implicants, Selection of prime implicants , Concluding Remarks

UNIT II **[11 hours]**

Combinational Logic Circuits: Introduction, Design Procedure, Adders, Subtractors, Co conversion

Combinational Logic with MSI and LSI:

Introduction, Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoders, Multiplexers, Programmable Logic Devices, Programmable Read Only memories (PROMs), Programmable Logic Arrays(PLAs), Programmable array logic (PAL)

UNIT III **[10 hours]**

Flip-Flops and Simple Flip –Flops Applications:

The Basic Bistable Element, Latches, Timing Considerations, Master Slave Flip-Flops(pulse-Triggered Flip-flops), Edge Triggered Flip Flops, Characteristic Equations

UNIT IV **[09 hours]**

Sequential Logic Circuits:

Registers, Counters, Design of Synchronous Counters

UNIT V **[11hours]**

Synchronous Sequential circuits:

Structure and Operation of Clocked Synchronous sequential Networks, Analysis of clocked synchronous sequential networks, Modeling clocked synchronous sequential network behavior, state table reduction, The state assignment, Completing the design of clocked synchronous sequential networks.

LAB experiments: – Verification of gates, implementation using basic gates and univers gates, Code conversion (Binary to gray, BCD to Excess 3), verify adders, subtracto multiplexers, demultiplexers, comparators & code converter, verification of Flip-flop counters, shift registers

TEXT BOOKS:

1. Digital logic and computer design- Morris Mano, Prentice Hall

2. Digital Principles and Design- Donald Givone, Tata Mc Graw Hill

REFERENCE BOOKS:

1. Fundamental of Logic Design- Charles Roth Jr., Thomas Learning
2. Digital Logic Applications and principles- John Yarbrough, **Pearson Education**

SIGNALS AND SYSTEMS (EE/EC/IT)
11ES3GCSAS

UNIT I

Definitions of a signal and a system, Classification of signals, Basic operations on signals, Elementary signals, Systems viewed as interconnection of operations, Properties of systems. **[10 Hours]**

UNIT II

Convolution, Impulse response representation, Convolution sum, Convolution integral, Convolution integral, Properties of impulse response, Differential and Difference equations representations, Block diagram representations **[12 Hours]**

UNIT III

Fourier Representation for signals-1: Introduction, Discrete time and continues time Fourier series (derivation of series excluded) and their properties

Fourier Representation for signals-2: Discrete and Continuous Fourier transforms (derivations of transforms are excluded) and their properties. **[12 Hours]**

UNIT IV

Applications of Fourier Representations: Introduction, Frequency response of LTI, Fourier transform representation of periodic signals, Fourier transform representation of discrete time signals. **[08 hours]**

UNIT V

Z-Transforms-1: Introduction, Z-transform, properties of ROC. Properties of Z transform inversion of Z-transforms.

Z-Transforms-2: Transform analysis of LTI Systems, Unilateral Z- Transform and its application to solve difference equations. **[10 Hours]**

Text Books:

1. Signals and Systems-Simon Haykin and Barry Van Veen, John Wiley & Sons, 2001. Reprint 2001

Reference Books:

1. Signals and Systems: Analysis of signals through linear systems- Michel J Roberts, TMH, 2003.
2. Signals and Systems-Alan V Oppenheim, Alan S Willsky and S.Hamid Nawab- Pearson Education Asia, 2nd ed 1997, Indian reprint 2002
3. Ganesh Rao and Sathish Tunga. " Signals and Systems", Sanguine Technical Publishers,2004
4. H.P. Hsu, R. Ranjan," Signals and Systems",Scham's outlines,TMH 2006
5. B.P.Lathi "Linear Systems and Signals.", Oxford University Press,2005

B.M.S COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU)

ANALOG SIGNAL PROCESSING (TC Only)

11TC3GCASP

Objective

ability to apply Mathematical concept of Fourier Series and Fourier Transforms obtain the frequency domain representation of continuous time signals

ability to apply Mathematical concept of convolution to perform time doma analysis of continuous time systems

ability to analyze signals and perform transformation of signals

ability to analyze system characteristics and hence classify systems

ability to design analog filters considering bandwidth, order, transition width a pass-band/stop-band ripple

ability to conduct suitable experiments to classify a given electronic circuit linear/non-linear

Prerequisites:

09MA1ICMAT	Engineering Mathematics –I
09MA2ICMAT	Engineering Mathematics –II
11MA3ICMAT	Engineering Mathematics –III
10ES3GCNAL	Network Analysis

UNIT I [11 hours]

INTRODUCTION

Signal definition; signal classification; signal transformation: independent, dependent variable; elementary signals; transformation of elementary signals. System definition;system classification; the Linear Time Invariant (LTI) system; properties of the LTI system.

UNIT II [11 hours]

TIME-DOMAIN REPRESENTATION & ANALYSIS OF LTI SYSTEMS

Impulse response; the convolution integral; methods of evaluating the convolution integral; Properties of impulse response. Measurement techniques for impulse responseof practical circuits; The constant coefficient differential equation; Solution to the differential equation; Block diagram representation.

UNIT III **[10 hours]**

FREQUENCY-DOMAIN REPRESENTATION OF NON-PERIODIC SIGNALS

Fourier transform of continuous time non-periodic signals; the frequency response; properties of Fourier transform

UNIT IV **[10 hours]**

FREQUENCY-DOMAIN REPRESENTATION PERIODIC SIGNALS

Fourier series of continuous time periodic signals; the spectrum of the periodic signal, Fourier transform of the periodic signals.

UNIT V **[10 hours]**

ANALOG SYSTEMS: Condition for Distortion-less transmission; definition of equalizer.

ANALOG FILTER DESIGN: Ideal filters characteristics. Design of LP Butterworth & Chebychev filters. Frequency transformation for LP to HP, BP, BP, BE. OP-AMP realization of a Butterworth filter.

TEXT BOOKS:

'Signals & Systems', Simon Haykin and Barry Van Veen, John Wily and Sons

REFERENCE BOOKS:

1. 'Signals & Systems', Allan V Oppenheim, Alan S Willsky, and A Hamid Nawab, Pearson Education Asia/ PHI
2. 'Signals and Systems', Schaum's Outline series
3. 'Linear systems and signals', B P Lathi, Oxford University Press

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MEDICAL SCIENCE (ML Only)
11ES3GCMDS

UNIT I [10 Hours]

Introduction: Homeostasis, Tissue, Cartilage: The internal environment and homeostasis, movement of substances within the body, body fluids, action potential,propagation of action potential. Epithelial tissue- simple epithelium, stratified epithelium,connective tissue- cells of connective tissue, loose connective tissue, Adipose tissue,Dense connective tissue, Lymphoid tissue, Cartilage- Hyaline cartilage, Fibrocartilage, Elastic cartilage.

Nervous System: Neurons: Properties of neurons, Cell bodies, Axon and Dendrites, Types of nerves, Synapse and neurotransmitters, neuromuscular junction. Central nervous system: neuroglia, meninges, ventricles of the brain and CSF. Brain: Cerebrum, functions of cerebrum, functional areas of the cerebrum. Brainstem: Cerebellum, Spinal cord- grey matter, white matter, motor nerve tracts, spinal nerves: nerve roots, plexuses, cranial nerves. Autonomic nervous system (in brief)- functions and effects.

UNIT II [10 Hours]

Cardiovascular System: Introduction, Blood vessels- Arteries and Arterioles, Veins and Venules, capillaries and sinusoids, control of blood vessel diameter, blood supplyinternalrespiration, cell nutrition. Heartposition, structure- pericardium, myocardium, endocardium, interior of the heart, flow of blood through the heart, blood supply to heart, Conducting system of the heart, factors affecting heart rate, the Cardiac cycle, cardiac output, blood pressure, control of blood pressure, pulse and factors affecting the pulse rate. Circulation of the blood- pulmonary circulation, systemic circulation, aorta, circulation of blood to head and neck, circulation of blood to upper limb, portal circulation.

UNIT III [10 Hours]

Digestive System: Introduction, Organs of the digestive system- mouth: tongue, teeth, salivary glands, pharynx, oesophagus, stomach, gastric juice and functions of stomachsmall intestine: structure, chemical digestion in small intestine, large intestine: structure, functions of the large intestine, rectum and anal canal. Pancreas, Liver.

UNIT IV **[12 Hours]**

Respiratory System: Introduction, Nose and Nasal cavity- position, structure and functions, pharynx, position, structure, functions. Larynx: position, structure and functions. Trachea, bronchi, bronchioles and alveoli, lungs- position, associated structure,

pleura and pleural cavity. Respiration muscles of respiration cycle of respiration, variables affecting respiration, lung volumes and capacity. Endocrine, Urinary and Reproductive System: Pituitary gland, thyroid gland, parathyroid gland, adrenal gland. Parts of urinary system, kidneys organs associated with the kidneys, gross and microscopic structure of the kidney, functions of the kidneys, ureter, urinary bladder, urethra, micturition.

UNIT V **[10 Hours]**

Skeletal System: Bone, Types of bone, structure, bone cells, functions of bone. Axial skeleton- skull, sinuses, Fontanelles, vertebral column characteristics of typical vertebra,different parts of vertebral column (parts only), features of vertebral column, movements and functions of vertebral column, sternum, ribs, shoulder girdle and upper limb, pelvic girdle and lower limb.

Muscles and Joints (Study of muscles along with joints): Muscle tissue: Skeletal muscle, Smooth muscle, Cardiac muscle, functions of muscle tissue, muscle tone and fatigue. Types of joint- Fibrous, Cartilaginous, Synovial, characteristics of synovial joints, shoulder joint, elbow joint, radioulnar joint, wrist joint, joints of hands and fingers,

Hip joint, Knee joint, ankle joint, joints of foot and toes.

Textbook:

1. Ross & Wilson's Anatomy and Physiology in Health and Illness – by Anne Waugh and Allison Grant, 9th Edition, Churchill Livingstone Publications.

Reference Books:

1. Concise Medical Physiology- by Sujit K. Chaudhuri, 5th Edition, New Central Book Agency Pvt. Ltd.
2. Essentials of Medical Physiology - by K. Sembulingam and Prema Sembulingam, 3rd Edition, Jaypee Publications.
3. Human Physiology: From Cells to Systems - by Lauralee Sherwood, 6th Edition, Brooks Cole Publication.

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ELECTRONIC INSTRUMENTATION AND MEASUREMENT
(EC/TC)
10ES3GCEIM

Objective:

ability to apply the knowledge of acquisition, transmission and manipulation of data in measurement system ability to identify, formulate and solve problems using static characteristics of measuring instruments such as error

ability to design and analyze dc ammeters, dc voltmeters, ac voltmeters and digital voltage meters and multimeter

ability to apply the knowledge of the principle of operation the digital storage oscilloscopes, signal generators and other specialized instruments

ability to apply the knowledge of circuit theory to analyze bridges and Q meter considering resistance, inductance and capacitance

ability to apply the knowledge of the principle of operation and performance of resistance, inductance, capacitance, temperature and photo transducers

Prerequisites:

08EC**1**ICEEE	Elements of Electronics Engineering
08EE**2**ICBEE	Basic Electrical Engineering

UNIT I **[08 hours]**

Introduction and Measurement Errors: Introduction, Instrumentation system , Advantages of electronic measurement, Errors in measurement, Gross errors and systematic errors, Absolute and relative errors, Static Characteristics., Introduction to Signal conditioning, Computer based Data Acquisition, virtual instrumentation

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UNIT II **[08 hours]**

Voltmeters and Multimeters: Introduction, Deflection instrument fundamentals, DC Ammeter, DC Voltmeter, AC Voltmeter, True RMS Voltmeters, peak response Voltmeter **Digital Voltmeters** – Introduction, DVM's based on V – T, V – F and Successiveapproximation principles, Digital Multi-meters

UNIT III **[08 hours]**

Signal Generators and oscilloscopes

Low frequency signal generator, Function generator, Pulse generator, RF Signal generator, sweep frequency generator, frequency synthesizer, arbitrary waveform generator Oscilloscopes: Cathode ray tube, Dual trace oscilloscope, Measurements with CRO, Digital storage oscilloscope, DSO applications, Spectrum Analyzer

UNIT IV **[08 hours]**

Measurement of resistance, inductance and capacitance

Introduction, Voltmeter and ammeter methods, substitution method, Wheatstone bridge, Low resistance measurement using kelvin's bridge, AC bridges, Capacitance Comparison Bridge, Maxwell's bridge, Digital L, C and R measurements, Q meter

UNIT V **[07 hours]**

Transducers

Introduction, Strain gauges, RTD, Thermistor, LVDT, capacitive transducer, Thermocouple, Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Semiconductor photo devices, IC sensor

TEXT BOOKS:

1. **"Electronic Instrumentation and Measurements",** David A Bell, PHI / Pearson Education, 2006.
2. **"Electronic Instrumentation",** H. S. Kalsi, TMH, 2004

REFERENCE BOOKS:

Electronics & Electrical measurements, A K Sawhney, Dhanpat Rai & sons, 9th edition

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MEASUREMENT TECHNIQUES (EE/IT/ML)
09ES3GCMST

UNIT I **[07 hours]**

Fundamentals of Measurement

Introduction, Static Characteristics, Dynamic Characteristics, Errors in measurement, Types of errors, Sources of error. Electrical Measuring Instruments:Types of Instruments, Principle of Operation, Constructional features of PMMC instrument, shunts & multipliers, universal shunt, multi range voltmeters.

UNIT II **[08 hours]**

Electronic Measuring Instruments:

Need for electronic measuring instruments, True RMS responding voltmeter, Digital voltmeters- Ramp Type, Integrating Type, Successive Approximation Type, Q meter, Digital Multimeter - Block Diagram description.

UNIT III **[08 hours]**

Measurement of Resistance, Inductance & Capacitance:

Wheatstone's Bridge- Sensitivity analysis, Limitations, Kelvin's Double Bridge, Maxwells Bridge, Schering Bridge, sources & Detectors, Minimization of AC Bridge Errors, Problems.

UNIT IV **[08 hours]**

Transducers -I:

Classification & Selection, Principle of operation of Thermocouples, Resistance Temperature Detectors, Thermistors, LVDT, Capacitive Transducers, Piezoelectric Transducers.

UNIT V **[08 hours]**

Transducers -II:

Strain Gauges- Types, Expression for gauge factor, Photosensitive Devices. Display Devices &Recorders : Method of Measuring Amplitude, Phase, Frequency & Period using CRO. Use of Lissajous Patterns. LCD & LED displays, Strip Chart & X-Y Recorders. Introduction to Printers.

TEXT BOOKS:

1. Modern Electronic Instrumentation & Measurement Technique- Albert D. Helfrick, William D. Cooper, 3/e, Pearson, Prentice Hall .
2. Electronic Instrumentation- H. S. Kalsi, Tata McGraw Hill.

REFERENCE BOOKS:

1. A Course in Electrical & Electronic Measurements & Instrumentation- A. K. Sawhney, 18/e, DhanpatRai& Co., New Delhi.
2. Electronic Instrumentation & Measurement- by David A. Bell, 2/e, PHI Publications.

ENGINEERING MATHEMATICS – IV
11MA4ICMAT

UNIT I **[10 hours]**

STATISTICS

Curve fitting – Fitting a straight line, fitting of a parabola, fitting of curves of the form $y = a b^x$, $y = a x^b$, $y = ae^{bx}$; Correlation and regression. **[4L+1T]**

PROBABILITY 1

Probability of an event, axiomatic definition, addition theorem, conditional probability, multiplication theorem, Bayes' theorem. **[4L+1T]**

UNIT II **[10 hours]**

PROBABILITY 2

Probability distributions: Random variables, Discrete probability distributions, continuous probability distributions, Some standard distributions: Binomial distribution, Poission distribution, exponential distribution, normal distribution. **[8L+2T]**

UNIT III **[10 hours]**

COMPLEX ANALYSIS 1

Function of a complex variable, Analytic functions, Cauchy-Riemann equations, construction of analytic functions, Cauchy-Reimann equations in Polar form. Transformations- $w = z2$, $w = ez$ and $w = z + \frac{a^2}{}$ $(z \neq o)$, Bilinear transformations. **[8L+2T]**

UNIT IV **[12 hours]**

COMPLEX ANALYSIS 2

Complex integration-Cauchy's theorem, Cauchy's integral formula, Taylor's and Laurent's series, Singular points, poles, residues, the residue theorem. **[5L+2T]**

SERIES SOLUTION OF DIFFERENTIAL EQUATIONS

Series solution-Frobenius method, series solution of Bessel's differential equation leading to Bessel function of first kind, equations reducible to Bessel's differential equation, series solution of Legendre's differential equation leading to Legendre polynomials, Rodrigue's formula. **[4L+1T]**

UNIT V **[10 hours]**

PROBABILITY 3

Joint Probability distributions: Case of discrete random variables, mathematical expectation, correlation, covariance.

Markov Chain: Probability vectors, stochastic matrices, fixed points, regular stochastic matrices. Markov chains, higher transition probabilities, stationary distribution of regular Markov chains and absorbing states. **[7L+3T]**

TEXT BOOKS:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 8th edition, Wiley Publications.
2. Higher Engineering Mathematics, B.S. Grewal, 40th edition, Khanna Publishers.

REFERENCE BOOKS:

1. Advanced Modern Engineering Mathematics, Glyn James, 3rd edition, 2004, Pearson Education.
2. Higher Engineering Mathematics, B.V. Ramana, 2007, Tata Mc. Graw H ill.
3 Advanced Engineering Mathematics, P. V. O' Neil, 5th Indian reprint, 2009, Cengage learning India Pvt. Ltd.

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Question Paper Pattern

1. Each unit consists of one full question with or without internal choice.
2. Internal choice may be there in maximum of two units.
3. Each full question consists of three or four subdivisions covering the entire syllabus of the Unit

OP-AMPS & LINEAR ICS
11ES4GCLIC

Objective:

ability to design, conduct and analyze experiments on Opamp and linear Integrated Circuits.

ability to design amplifier/oscillator/filter/A-D and D-A converter /regulator /comparator modules considering IC saturation ,efficiency ,loading and cost as the criteria.

ability to work in multiple teams to perform experiments on linear ICs using discrete components/multisim software leading to improvement in team work and leadership qualities.

ability to identify, formulate and solve problems in any analog electronics domain using Opamps and linear ICs.

ability to apply technical analysis and design knowledge of Analog Electronic Circuits using Opamp and linear ICs for engineering applications.

Prerequisites:

08EC**1**ICEEE	Elements of Electronics Engineering
11ES**3**GCAEC	Analog Electronic Circuits

UNIT I **[10 hours]**

Circuit configurations for linear ICs: Introduction, Current sources- current mirror, basic current source circuit

Differential amplifiers: Differential amplifiers using BJT(DC analysis only), CMRR, Input impedance Ri, output impedance Ro

Operational amplifier characteristics : Introduction, ideal op-amp, practical op-amp,

IC 741 bi-polar opamp-bias circuit, input stage, gain stage, output stage, DC performance characteristics of opamp, AC performance characteristics of opamp, slew rate, noise, open-loop configurations, closed loop op-amp configurations, differential amplifiers, general description, power supply connections

UNIT II **[10 hours]**

a. Applications of op-amps: Introduction, sign changer, scale changer, phase shift circuits, voltage followers, voltage controlled voltage source, current sources, inverting current amplifier, current controlled current source, V-to-I , I-to-V converters, adder, subtractor, adder-subtractor, instrumentation amplifier, integrator, differentiator

b. Op-amp non-linear circuits: Introduction, opamp comparator, zero-cross detector, Schmitt trigger, Precision rectifiers, peak Detectors, sample -and -hold circuit, clippers, clampers

UNIT III **[12 hours]**

a. Active Filters: Introduction, comparison between passive and active network design, Design of low pass filters, high pass filters, all-pass filters

b.Waveform generators: Introduction, sine-wave generators- Weinbridge, RC phase shift, Multivibrators- astable, monostable, triangular waveform generators

UNIT IV **[10 hours]**

a. 555 timer: General description of 555, Monostable operation, Astable Operation,

b. Voltage regulators: Introduction, Basics of voltage regulator, linear voltage regulator using op amp- single polarity linear voltage regulator, IC voltage Regulators, Ic723 General purpose Regulator. SMPS –Introduction only

UNIT V **[10 hours]**

A/D and D/A convertors: Introduction, Analog and digital data conversions, specifications of DAC, basic D/A conversion techniques- weighted resistor DAC, R-2R DAC, A/D converters, specifications of ADC, classification of ADC, different types of ADC

LAB Experiments :

Inverting amplifier, non-inverting amplifier, summing amplifier and voltage follower, precision half wave, and full wave rectifier, clipping circuits, clamping circuits, differentiator and integrator, Schmitt trigger and zero crossing detector, Wien bridge oscillator, first order low-pass and high pass filter, IC 723 low voltage and high voltage regulator, A/D and D/A converters.

TEXT BOOKS:

1. Linear Integrated circuits - S. Salivahanan, V S Kanchana Bhaaskaran, TMH

REFERENCE BOOK:

1. Op-Amps and Linear Integrated Circuits Ramakanth A.Gayakwad,4th ed,PHI.
2. Linear Integrated circuits; D.Roy Choudhury and Shail B.Jain,2nd ed, Reprint 2006, New Age International
3. Op-Amps and Linear ICs: David A Bell, 2nd Edition, PHI

MICROCONTROLLERS
11ES4GCMCS

Objective

Ability to apply the basics of the 8086 microprocessor for real world applications
Ability to identify a problem and to achieve solution by making small modules which involves interfacing of peripherals to 8086 as well as programming in assembly or C
Impart education to pursue courses related to embedded systems in the future

Prerequisites:

08EC1ICEEE	Elements of Electronics Engineering
11ES3GCDEC	Digital Electronics

UNIT I **[08 hours]**

INTRODUCTION TO MICROCONTROLLERS: Microprocessors and microcontroller, Introduction, Difference between Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Embedded Electronic Systems and Microcontrollers, comparison of Different microcontrollers and applications.

The 8051 Architecture: Introduction, 8051 Microcontroller Hardware, Input / Output Pins, Ports and Circuits, External Memory.

UNIT III **[08 hours]**

EMBEDDED 'C' PROGRAMMING: 8051 programming in C: Data types and time delays in 8051 C, I/O programming, logic operations, data conversion programs, accessing code ROM space, data serialization.

Timer / Counter Programming in 8051: Counters and timers programming 8051 Timers, Counter Programming, programming timers 0 and 1 in 8051 C.

UNIT IV **[08 hours]**

8051 Serial Communication: Basics of Serial Communication- Serial data input/output, 8051 connections to RS-232, 8051 Serial communication Programming,

Interrupts Programming:, 8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Interrupt programming in C

UNIT V **[07 hours]**

8051 INTERFACING AND APPLICATIONS:

Interfacing 8051 to LCD, Keyboard, DAC, ADC Stepper motor interfacing.

LABORATORY EXPERIMENTS:

Part A: Data Transfer, Logical-Byte/Bit manipulations, Jump and Subroutine Calls using Assembly language, counters and delay generation using timers, Embedded C programs
Part B: Interfacing: LCD Display, Stepper motor control using interrupt, Elevator interface and & 7 segment interface, DAC, keyboard.

The Experiments will be implemented using 'Keil' software with Embedded IDE. For interface, 8051 hardware kit is used.

TEXT BOOKS:

1. **"The 8051 Microcontroller Architecture, Programming & Applications",**
Kenneth J. Ayala 2e, Thomson Learning 2005
2 **"The 8051 Microcontroller and Embedded Systems – using assembly and C ",**
Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006

REFERENCE BOOKS:

1. "Programming and Customizing the 8051 Microcontroller", Predko ;, TMH
2. "Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education, 2005
3. "PIC Microcontrollers", J.B. Peatman;" PHI, 2006

FIELD THEORY(EC/EE/IT/TC)
11ES4GCFTH

Objectives:

Ability to apply the concepts of vectors and calculus, electric and magnetic fields for electromagnetic waves (propagation) Ability to analyze and solve problems using Coulomb's law, Gauss' Law, Biot Savart law, Laplace and Poisson's equations to acquire the knowledge of their practical application

To emphasize the importance of Maxwell's equation and apply them for time varying fields

Prerequisites:

09MA2ICMAT	Engineering Mathematics-II
09PY2ICPHY	Engineering Physics

UNIT I **[10 hours]**

Coulomb's Law, Electric Field Intensity (EFI): Experimental Law, EFI, due to Line Charge, Surface and Volume Charge

Electric Flux Density (EFD), Gauss' Law, Divergence: Electric Flux Density (EFD), Gauss' Law, Application, Divergence and Divergence Theorem .

UNIT II **[10 hours]**

Energy and Potential: Energy spent in moving charge, Definition of Potential Difference (PD), PD due to Point Charge and System of Charge, Energy Density

Current and current density: Current and Current Density, Continuity of Current, Conductor, Properties, and Boundary Conditions

UNIT III **[10 hours]**

Dielectric and capacitance:- Dielectric materials, boundary conditions, capacitance of different configuration.

Poisson's and Laplace's equations:- Derivations of Poisson's and Laplace's Equations, solution of Poisson's and Laplace's equation for Single Variables.

UNIT IV **[10 hours]**

Steady Magnetic Field:- Biot-Savart Law, Ampere's circuital law, curl, Magnetic Flux,Flux Density, Scalar and Vector Magnetic Potentials.

UNIT V **[12 hours]**

Magnetic forces and Inductance:- Force on a moving charge, Force on different current element, Magnetic Boundary Condition, Inductance and Mutual Inductance.

Time varying fields and Maxwell's equations:- Faraday's Law, Displacement Current, Maxwell's Equations in Point and Integral Form, Uniform plane waves, Wave equations , solution of wave equation, wave propagation through good dielectric, good conductor, skin depth, Poynting Theorem.

TEXT BOOK:

Engineering Electromagnetics, William J Hayt Jr. and John A Buck, Tata McGraw-Hill, 7th Edition, 2006.

REFERENCE BOOK:

Electromagnetics with Applications, John Krauss and Daniel A Fleisch, McGraw-Hill, 5th Edition, 1999.

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SIGNALS AND SYSTEMS (ML Only)
11ES4GCSAS

UNIT I

Definitions of a signal and a system, Classification of signals, Basic operations on signals, Elementary signals, Systems viewed as interconnection of operations, Properties of systems. **[10 Hours]**

UNIT II

Convolution, Impulse response representation, Convolution sum, Convolution integral, Convolution integral, Properties of impulse response, Differential and Difference equations representations, Block diagram representations **[12 Hours]**

UNIT III

Fourier Representation for signals-1: Introduction, Discrete time and continues time Fourier series (derivation of series excluded) and their properties

Fourier Representation for signals-2: Discrete and Continuous Fourier transforms (derivations of transforms are excluded) and their properties. **[12 Hours]**

UNIT IV

Applications of Fourier Representations: Introduction, Frequency response of LTI, Fourier transform representation of periodic signals, Fourier transform

representation of discrete time signals. **[08 hours]**

UNIT V

Z-Transforms-1: Introduction, Z-transform, properties of ROC. Properties of Z transform inversion of Z-transforms.

Z-Transforms-2: Transform analysis of LTI Systems, Unilateral Z- Transform and its application to solve difference equations. **[10 Hours]**

Text Books:

1. Signals and Systems-Simon Haykin and Barry Van Veen, John Wiley & Sons, 2001. Reprint 2001

Reference Books:

1. Signals and Systems: Analysis of signals through linear systems- Michel J Roberts, TMH, 2003.
2. Signals and Systems-Alan V Oppenheim, Alan S Willsky and S.Hamid Nawab- Pearson Education Asia, 2nd ed 1997, Indian reprint 2002
3. Ganesh Rao and Sathish Tunga. " Signals and Systems", Sanguine Technical Publishers,2004
4. H.P. Hsu, R. Ranjan," Signals and Systems",Scham's outlines,TMH 2006
5. B.P.Lathi "Linear Systems and Signals.", Oxford University Press,2005

CONTROL SYSTEMS
09ES4GCCST

Objective:

ability to apply knowledge of Mathematical modeling of linear systems for Mechanical and Analog systems

ability to design, conduct and analyze experiments for stability analysis using Nyquist plot, polar plots, bode plots and root locus concepts.

ability to design time response analysis of first and second order control system modules considering steady state error and error constants.

ability to identify, formulate and solve problems of open loop/ closed loop system in time and frequency domain

Prerequisites:

09MA**1**ICMAT	Engineering Mathematics –I
09MA**2**ICMAT	Engineering Mathematics –II
10ES**3**GCNAL	Network Analysis

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UNIT I **[12 hours]**

Introduction: Examples of Control Systems, open loop vs Closed loop Systems, Classifications of Control Systems.

Mathematical Modeling of Linear Systems: Transfer functions, Mechanical Systems, Analogous Systems, Block diagram, Signal Flow graph (excluding gear trains lever)

UNIT II **[10 hours]**

Time response analysis of Control Systems : Step response of first order, second order systems, response specification , steady state error and error constants.

UNIT III **[10 hours]**

Stability Analysis: Concept of stability, RH criterion, applications of RH criterion with limitations, Nyquist plot, Polar plots, Stability Analysis using Nyquist criterion\

UNIT IV **[10 hours]**

Root locus technique: Introduction to root locus concepts, Construction rules, Analysis of stability by root locus plot.

UNIT V **[10 hours]**

Frequency response Analysis: Bode plots, Relative stability, Frequency domain specification.

TEXT BOOK:

Control Engineering by Nagrath & Gopal, New Age International Publishers

REFERENCE BOOKS:

1. **Modern control Engineering**- Ogata, Prentice Hall

2. **Automatic Control Systems**- B.C Kuo, John Wiley and Sons

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FUNDAMENTALS OF HDL (EC/TC/ML/IT)
09ES4GCHDL

UNIT I **[07 hours]**

Introduction: Why HDL? , A Brief History of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions, simulation and synthesis, Brief comparison of VHDL and Verilog

UNIT II **[08 hours]**

Data-Flow Descriptions: Highlights of Data-Flow Descriptions, Structure of Data-Flow Description, Data Type – Vectors. Behavioral Descriptions: Behavioral Description highlights, structure of HDL behavioral Description, The VHDL variable –Assignment Statement, sequential statements.

UNIT III **[08 hours]**

Structural Descriptions: Highlights of structural Description, Organization of the structural Descriptions, Binding, state Machines, Generate, Generic, and Parameter statements.

UNIT IV **[08 hours]**

Procedures and Functions: Procedures, Tasks, and Functions: Highlights of Procedures, tasks, and Functions, Procedures and tasks, Functions. Advanced HDL Descriptions: File Processing, Examples of File Processing.

UNIT V **[08 hours]**

Synthesis Basics: Highlights of Synthesis, Synthesis information from Entity and Module, Mapping Process and Always in the Hardware Domain.

LAB Experiments

Combinational logic circuits, sequential circuits using data flow (simulation and implementing using FPGA/CPLD) sequential descriptions & structural descriptions. Interfacing experiments : stepper motor, dc motor, relay, waveform generation.

TEXT BOOK:

HDL Programming (VHDL and Verilog)- Nazeih M.Botros- Dreamtech Press (Available through John Wiley – India and Thomson Learning), 2006 Edition

REFERENCE BOOKS:

1**. Verilog HDL** –Samir Palnitkar, Pearson Education

2. **VHDL** –Douglas Perry,TMH

3. **Fundamentals of Digital Logic with Verilog Design**-Stephen Brown, TMH

4. **Circuit Design with VHDL-**Volnei A.Pedroni, PHI

TRANSFORMERS AND INDUCTION MACHINES (EE only)
11EE4GCTIM

UNIT I **[08 hours]**

(a)Basic Concepts: Principle of transformer action for voltage transformation. Constructional details of shell type and core type single-phase transformers.

(b) Single-phase Transformers: Concept of ideal transformer. Equation for E.M.F. induced in the two windings. Voltage transformation ratio. Ideal transformer on no-load and corresponding phasor diagram. Concept of M.M.F. balance in the magnetic circuit of an ideal transformer. Current transformation ratio. Concept of referring impedance connected on one side of ideal transformer to the other side. Practical transformer – how it deviates from the ideal transformer. Development of exact equivalent circuit of a practical

transformer. Approximate equivalent circuit of a practical transformer.

UNIT II **[08 hours]**

Phasor diagram of a practical transformer for both no-load and loaded conditions. Losses, power and all-day efficiency, regulation. Testing of transformers — O.C. test, S.C. test and predetermination of efficiency and regulation. Sumpner's test. Parallel operation — need, conditions to be satisfied for parallel operation. Load sharing.

UNIT III **[07 hours]**

Three-phase Transformers: All types of three-phase transformer connections . Choice of connections. Bank of single-phase transformers for three-phase operation. Phase conversion using transformers. Scott connection for three-phase to two-phase conversion.

UNIT IV **[07 Hours]**

Basic Concepts of Induction Machines: Concept of rotating magnetic field. Operating principle, construction of squirrel-cage and slip-ring Induction Motor: Phasor diagram of induction motor on no-load and loaded conditions. Visualization of a three-phase induction

motor as a generalized transformer with a rotating secondary and obtaining its equivalent circuit. Different kinds of power losses in an induction motor. Efficiency. Performance evaluation — output power, torque, efficiency, current and power factor.

UNIT V **[09 hours]**

(a) Torque-slip characteristics of induction motor, No-load and blocked rotor tests. Circle diagram and there from performance evaluation of the motor. Equivalent circuit and performance of double-cage and deep-bar motors.

(b) Starting and Control of Three-phase Induction Motor, Need for starter. DOL, Y-Delta and auto-transformer starting. Rotor resistance starting.. Speed control — voltage, frequency, and rotor resistance variations.

LAB EXPERIMENTS

Test on single phase transformer: OC, SC test and pre-determination of efficiency and regulation, Load test and performance evaluation , Sumpner's test, polarity test, Parallel operation, Three phase transformer connections and scott connection. Tests on three phase induction motor. Load test, OC and SC tests and development of equivalent circuit andperformance evaluation through Circle diagram, Speed control of 3-phase induction motor

TEXT BOOKS:

Theory and performance of Electrical Machines –J.B.Gupta .., S.K.Kataria and sons – New Delhi.

REFERENCE BOOKS:

1. **Electric Machines,** I. J. Nagrath and D. P. Kothari, 3rd Edition, T.M.H., Education Pvt Ltd.., New Delhi
2. **Electric Machines,** Ashfaq Husain, DhanpatRai& Co., Second Edition

DISCRETE TIME SIGNAL PROCESSING
11TC5DCDTS

Objective:

ability to apply Fourier knowledge of Mathematics to periodic and non-periodic discrete time signals

ability to apply the convolution concept of Mathematics to perform time domain analysis of digital LTI systems

ability to design digital filters (FIR and IIR) considering bandwidth, filter order, transition width, pass-band/stop band ripple, stability, causality, speed, etc

ability to analyze digital systems and hence classify them (based on stability, linearity, causality, frequency characteristics)

ability to test designed filters on real signals like: audio/image

ability to perform wavelet based analysis and representation of digital signals (1-dimenional and 2-dimensional)

Prerequisites:

09MA1ICMAT	Engineering Mathematics –I
09MA2ICMAT	Engineering Mathematics –II
11MA3ICMAT	Engineering Mathematics –III
11TC3GCASP	Analog Signal Processing

UNIT I **[12 hours]**

Discrete Time Signal definition; signal classification; signal transformation: independent, dependent variable; elementary signals; transformation of elementary signals.

Discrete Time System definition; system classification; the Linear Time Invariant (LTI) system; properties of the LTI system.
Time Domain Analysis of Discrete time systems: Impulse response; the convolution sum; methods of evaluating the convolution sum; overlap-save and overlap-add method; Properties of impulse response.

UNIT II [12 hours]

Discrete Fourier Transforms (DFT): The Discrete Fourier Transform: periodic and non-periodic signals; Properties of DFT, multiplication of two DFTs- the circular convolution, additional DFT properties, use of DFT in linear filtering

Fast-Fourier-Transform (FFT) algorithms: Direct computation of DFT, need for efficient computation of the DFT (FFT algorithms). Radix-2 FFT algorithm for the computation of DFT and IDFT–Decimation-in-Time and Decimation-in-Frequency algorithms.

UNIT III [09 hours]

FIR filters: Introduction to FIR filters, Design using the window technique, design of FIR filters using - Rectangular, Hamming, Hanning, Generalized Hamming window, Bartlett, Blackman window functions. FIR filter realization
Design using frequency sampling technique; Frequency sampling structure for FIR filters

UNIT IV [09 hours]

IIR filters: Introduction to IIR filters. Design of IIR filters from analog filters (Butterworth and Chebyshev) using: impulse invariance method, Mapping of transfer functions: Approximation of derivative (backward difference and bilinear transformation) method, Matched z transforms. IIR filter realization.

UNIT V [10 hours]

Z-Transforms; Properties of Z transform;
Unilateral Z-Transform; Solution to difference equation; Obtaining the impulse response, step response of the given system, The pole-zero plot; Stability criteria; Relating to the frequency response;
Introduction to wavelet transforms; approximation and detail coefficients of a given discrete time sequence.

Laboratory exercises using C/Matlab/LabVIEW:

Convolution: linear & circular, Autocorrelation, Cross correlation, difference equation solution, Discrete Fourier Transform and its inverse, FIR filter design, IIR filter design, impulse response, pole-zero plot, sampling theorem.

Audio signal: time domain representation, frequency domain representation, filtering . Wavelet transforms.

TEXT BOOK:

Theory and application of Digital signal processing, Lawrence R Rabiner and Bernard Gold, Prentice Hall, Easter Economy Edition

REFERENCE BOOKS:

1. **Discrete Time Signal Processing**, Oppenheim & Schaffer, PHI, 2003.
2. **Digital signal processing – Principles Algorithms & Applications**, Proakis & Monalakis, Pearson education, 4th Edition, New Delhi, 2007
3. **Digital Signal Processing,** S. K. Mitra, Tata Mc-Graw Hill, 3rd Edition, 2010.
4. **Digital Signal Processing,** Lee Tan: Elsevier publications, 2007
5. **Digital Signal Processing:** Fundamentals and Applications, Li Tan, Schaum's Outline of Digital Signal Processing ,Monson Hayes

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ANALOG COMMUNICATION
10TC5DCACM

Objective:

ability to apply Mathematical concepts of convolution, correlation and Fourier Transforms to arrive at the canonical representation of band-pass signals

ability to apply Mathematical concepts of random signals, to compute statistical parameters of random signals, and hence compute the corresponding parameters when passed through a LTI system

ability to apply Mathematical concepts of convolution and Fourier Transforms to arrive at the time-domain and frequency-domain representation of amplitude modulated and angle modulated waveforms

ability to design and implement electronic circuits for generation/demodulation of analog modulated waveforms

ability to use Matlab software tool to obtain signals at various stages of analog communication systems

Prerequisites:

11MA3ICMAT	Engineering Mathematics –III
11MA4ICMAT	Engineering Mathematics –IV
11TC3GCASP	Analog Signal Processing

UNIT I **[10 hours]**

Convolution, Auto correlation, cross correlation, and their properties, Hilbert transform, band pass signals, in-phase and quadrature-phase components, canonical representation of band pass signals, natural, pre and complex envelop of band pass signals.

UNIT II **[10 hours]**

RANDOM PROCESS: Random variables: Several random variables. Statistical averages: Function of Random variables, moments, Mean, Correlation and Covariance function: Principles of autocorrelation function, cross – correlation functions. Central limit theorem, Properties of Gaussian process. Transmission of random signals through linear systems.

NOISE: Introduction, shot noise, thermal noise, white noise, Noise equivalent bandwidth, Narrow bandwidth, Noise Figure, Equivalent noise temperature, cascade connection of two-port networks.

UNIT III **[10 hours]**

AMPLITUDE MODULATION:

Introduction, AM: Time-Domain description, Frequency – Domain description. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelop detector. Receiver model, Figure of merit of AM.

Double side band suppressed carrier modulation (DSBSC): Time-Domain description, Frequency-Domain representation, Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves, Figure of merit of DSBSC

UNIT IV **[11 hours]**

SINGLE SIDE-BAND MODULATION (SSB): Quadrature carrier multiplexing, Canonical representation of SSB, Single side-band modulation, Frequency-Domain description of SSB wave. Phase discrimination method for generating an SSB modulated wave. Demodulation of SSB waves, Figure of merit of SSB

VESTIGIAL SIDE-BAND MODULATION (VSB): Frequency – Domain description, Generation of VSB modulated wave, Time - Domain Canonical representation of VSB, Envelop detection of VSB wave plus carrier, Comparison of amplitude modulation techniques, Frequency translation, **FDM:** Frequency division multiplexing, Application: Radio broadcasting, AM radio.

UNIT V **[11 hours]**

ANGLE MODULATION (FM): Basic definitions, FM, narrow band FM, wide band FM, transmission bandwidth of FM waves, generation of FM waves: indirect FM and direct FM.

Demodulation of FM waves, FM stereo multiplexing, Phase-locked loop, First order model of the phase – locked loop, Linear model of the phase – locked loop. Noise in FM receivers, FM threshold effect, Pre-emphasis and De-emphasis in FM. Figure of merit of FM

LAB Experiments

Part A: Using discrete components

Analog filters; Audio amplifiers; Generation and demodulation of AM, DSB-SC, FM, PM, FM with pre-emphasis and de-emphasis; Generation of SSB;

Part B: Using LabVIEW/ Matlab

Generate and demodulate AM, DSB-SC, SSB, FM, PM; study effect of phase and frequency error in local oscillator in each case.

TEXT BOOKS:

1. **Communication Systems**, Simon Haykins, 3rd Edition, John Willey, 1996.
2. **An Introduction to Analog and Digital Communication,** Simon Haykins, John Wiley, 2003.

REFERENCE BOOKS:

1. **Modern digital and analog Communication systems** B. P. Lathi, 3rd ed 2005 Oxford University press.
2. **Communication Systems,** Harold P.E, Stern Samy and A Mahmond, Pearson Edn, 2004.
3. **Communication Systems:** Singh and Sapre: Analog and digital TMH 2nd , Ed 2007.

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DIGITAL SWITCHING SYSTEMS
10TC5DCDSS

Objective

Ability to design mathematical model considering analytical solutions to tele traffic problems.

Ability to apply knowledge of lost call systems and Queuing systems to determine Grade of service.

Ability to design a Grading considering the inlets and outlets of switches.

Ability to design a switching network considering the incoming trunks, outgoing trunks and number of stages.

Ability to identify, formulate and solve problems considering Stability, attenuation and losses.

Ability to apply knowledge of Reliability modeling to determine the downtimes of the subsystems.

Prerequisites:

11ES**3**GCAEC	Analog Electronic Circuits
11ES**3**GCDEC	Digital Electronics

UNIT I **[08 hours]**

Developments of telecommunications, Network structure, Network services, terminology, Regulation, Standards. Introduction to telecommunications transmission, four wire circuits.

EVOLUTION OF SWITCHING SYSTEMS: Introduction, Message switching, Circuit switching, Functions of switching systems, Distribution systems, Basics of crossbar systems, Electronic switching, Digital switching systems.

UNIT II **[08 hours]**

DIGITAL SWITCHING SYSTEMS: Evolution of digital switching systems, stored program control switching systems, Digital switching system fundamentals, Building blocks of a digital switching system, Basic call processing.

TELECOMMUNICATIONS TRAFFIC: Introduction, Unit of traffic, Congestion, Mathematical model, lost call systems, Queuing systems.

UNIT III [08 hours]

Switching Networks: Introduction, Single stage networks, Gradings, Link Systems, GOS of Linked systems. SDS, TDS , Non blocking networks

UNIT IV [07 hours]

SWITCHING SYSTEM SOFTWARE: Introduction, Scope, Basic software architecture, Digital switching system software classification, Call models, Software linkages during call, Call features, Recovery strategy, and Analysis report. Reliability analysis

UNIT V [08 hours]

Reliability Modeling and analysis: Purpose, system reliability assessment, failures Models, state Transitions Diagram CPC, clock subsystems, N/W Controller subsystem, switching N/W, link and trunk downtimes, call cutoffs.

TEXT BOOKS:

1. **Telecommunication and Switching, Traffic and Networks -** J E Flood: Pearson Education, 2002.
2. **Digital Switching Systems,** Syed R. Ali, TMH Ed 2002.
3. **Digital Telephony -** John C Bellamy: Wiley India 3rd Ed, 2000

REFERENCE BOOK:

Thiagarajan Vishwanathan, "Telecommunications Switching Systems and Networks' PHI, 2001

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FUNDAMENTALS OF CMOS VLSI
10TC5DCVLI

Objective:

ability to apply knowledge of Science in VLSI

ability to design VLSI modules considering power, speed, cost and area.

ability to identify, formulate and solve problems in VLSI

impart education to develop Engineering solutions with an awareness of industry concerns

acquire VLSI knowledge on continuously evolving Telecommunication Engineering products

ability to apply VLSI knowledge and use engineering tools necessary for engineering practice

Prerequisites:

11ES3GCAEC	Analog Electronic Circuits
11ES3GCDEC	Digital Electronics

UNIT I [12 hours]

Basic MOS technology: Integrated circuit's era. Enhancement and depletion mode MOS transistors. nMOS fabrication. CMOS fabrication. Thermal aspects of processing. BiCMOS technology. Production of E-beam masks.

Circuit design processes: MOS layers. Stick diagrams. Design rules and layout – lambdabased design and other rules. Examples. Layout diagrams. Symbolic diagrams. Basic Physical Design of Simple logic gates

UNIT II [10 hours]

CMOS logic structures : CMOS Complementary Logic, Bi CMOS Logic, Pseudo-nMOS Logic, Dynamic CMOS Logic, Clocked CMOS Logic, Pass Transistor Logic, CMOS Domino Logic Cascaded Voltage Switch Logic (CVSL), The Transmission Gate, Tristate Inverter

UNIT III [10 hours]

Basic circuit concepts: Sheet resistance, Area capacitances, Capacitance calculations, The delay unit, Inverter delays, Driving capacitive loads, Propagation delays, Wiring capacitances.

Scaling of MOS circuits: Scaling models and factors. Limits on scaling.

UNIT IV **[10 hours]**

CMOS subsystem design: Architectural issues. Switch logic. Gate logic. Design examples – combinational logic. Clocked circuits. Other system considerations.

CMOS subsystem design processes: General considerations. Process illustration. ALU subsystem. Adders. Multipliers.

UNIT V **[10 hours]**

Memory, registers, and clock: Timing considerations. Memory elements.

Testability: Performance parameters. Layout issues. I/O pads. Real estate System delays. Ground rules for design. Test and testability.

TEXT BOOKS:

1. **Douglas A. Pucknell & Kamran Eshraghian, "**Basic VLSI Design" PHI 3rd Edition (original Edition – 1994), 2005.
2. **Neil H. E. Weste and K. Eshragian,"** Principles of CMOS VLSI Design: A Systems Perspective," 2nd edition, Pearson Education (Asia) Pvt. Ltd., 2000.

REFERENCE BOOKS:

1. **M. K. Achuthan and K. N. Bhat,** "Fundamentals of Semiconductor Devices", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.
2. **Sung-Mo Kang & Yusuf Leblebici,** "CMOS Digital Integrated Circuits: Analysis and Design", 3rd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007.
3. **D.A Hodges, H.G Jackson and R.A Saleh**. "Analysis and Design of Digital Integrated Circuits"- 3rd Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

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DSP ALGORITHMS AND ARCHITECTURE
12TC5DCDSA

Objective:

Ability to apply knowledge of Mathematics and Engineering to implement signal processing algorithms on DSP processor

Ability to use an Integrated Development Environment (IDE) that includes simulators, debuggers, cross compilers etc for converting sourc code into executable machine code and download it to the target processor to execute signal processing applications.

Ability to acquire knowledge on continuously evolving fixed and floating point

processors

impart education to develop Engineering solutions using digital signal processor.

Ability to work in multiple teams leading to improvement in team work and leadership qualities.

Prerequisites

11ES3GCDEC Digital Electronics

UNIT I [8Hours]

INTRODUCTION TO DIGITAL SIGNAL PROCESSING: Introduction, A Digital Signal-Processing Systems and applications, software development tools, hardware issues, system consideration, Fixed and floating point DSP,

Implementation considerations-data representations and arithmetic, Dynamic range,

resolution and precision, Decimation and Interpolation, Programmable Digital Signal Processors, Major features of Programmable digital Signal Processors,

UNIT II [8 Hours]

ARCHITECTURES FOR PROGRAMMABLE DIGITAL SIGNAL-PROCESSING DEVEICES: Basic Architectural Features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External Interfacing..

UNIT III [8 Hours]

PROGRAMMABLE DIGITAL SIGNAL PROCESSORS- Data Addressing Modes of TMS32OC54xx., Memory space of TMS 320C54xx processors, Program control, Assembler directives , Detail Study of TMS320C54X & 54xx Instructions and Programming, On- Chip peripherals, Interrupts of TMS32OC54XX Processors, Pipeline Operation of TMS32OC54xx Processor.

UNIT IV [8 Hours]

IMPLEMENTATION OF BASIC DSP ALGORITHMS AND FFT ALGORITHMS- Introduction, The Q-notation, FIR Filters, IIR Filters, Interpolation and Decimation Filters and examples, An FFT Algorithm for DFT Computation, Overflow and Scaling, Bit-Reversed Index Generation & Implementation on the TMS32OC54xx

UNIT V [7 Hours]

INTERFACING MEMORY AND PARALLEL I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICE - Introduction, memory space organization, external bus interfacing signals, memory interface, parallel I/O interface, programmed I/O, interrupts and I/O, direct Memory Access (DMA).

LAB EXPREMENTS

C and assembly program to implement Linear Convolution of 2 sequences circular Convolution of 2 sequences, N point DFT of a given sequence, C program to realize FIR filter, multiplication of 2 Q-15 numbers.

TEXT BOOK:

1. **Digital Signal Processing –** Avatar Singh and S. Srinivasan, Thomson Learning, 2004.
2. **Digital Signal Processors-**Sen M Kuo, Woon-Seng S. Gan, Pearson Education, 2005.
3. **Modern Digital Signal Processing-**V Udayashankara, PHI publications.

REFERENCE BOOKS:

1. Texas Instruments Reference manual
2. **Digital Signal Processing**, Shaila D Apte, Wiley India, 2009.
3. **Digital Signal Processors –** B Venkataramani and M Bhaskar TMH, 2002.
4. **Architectures for Digital Signal Processing –** Peter Pirsch John Weily, 2007.

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DIGITAL COMMMUNICATION
10TC6DCDCM

Objective:

ability to apply mathematical concepts of convolution and Fourier analysis to develop to time-domain and frequency domain representation of digital communication modules

ability to apply concepts of 'Analog Signal Processing', 'Discrete time signal processing' and 'Analog Communication', to develop base-band and band-pass transmission of digital data

ability to design and implement electronics circuits forgeneration/demodulation of digital communication modulated waveforms (ASK, BPSK, FSK, QPSK)

ability to use Matlab software tool to obtain signals at various stages of digital communication systems

ability to use LabVIEW software tool to obtain signals at various stages of digital communication systems

Prerequisites:

10TC5DCACM	Analog Communication
11TC3GCASP	Analog Signal Processing
11MA4ICMAT	Engineering Mathematics –IV

UNIT I [09 hours]

Pulse Analog Modulation: Sampling theorem, sampling of Low pass, band-pass signals, Reconstruction of message from its samples, PAM, PWM, PPM, TDM, PAM-TDM, Quantization, Quantization Error, Companding A-law and - law

UNIT II [12 hours]

Pulse-Digital Modulation: Elements of PCM, Noise in PCM systems, Differential PCM, Delta modulation, Adaptive delta modulation, generation and detection of PCM, TDM-PCM, their comparisons with FDM; Typical multiplexed systems: T1 and E1 digital Hierarchy.

UNIT III **[10 hours]**

Base-band Data transmission: Elements of binary PAM, Baseband shaping, Optimum transmitting and receiving filters Correlative coding, Baseband M-ary PAM, Adaptive equalization, Eye pattern, Examples: Line coding

UNIT IV **[10 hours]**

Gram-Schmidt orthogonalization procedure, Matched filters, Properties of matched filters. Band-pass data transmission: Time and frequency domain representation of ASK, FSK, PSK, QPSK, MSK, GMSK; their generation and detection; Performance analysis-power and bandwidth, bit error rate

UNIT V **[11 hours]**

Need for Spread Spectrum Modulation. PN sequence and its properties, Direct sequence SS system- DS/BPSK Transmitter & Receiver, Frequency hopping, Processing gain, Jamming margin,
Introduction to OFDM.

Part A:

Using suitable components Generate PAM, PWM, PPM, PAM-TDM, DM, ASK, PSK, FSK, QPSK, PCM, Natural sampling, flat top sampling, PN sequence, SS, ITC experiments

Part B:

Using LabVIEW

Generation and demodulation of PAM, PWM, PPM, PAM-TDM, DM, ASK, PSK, FSK, QPSK; performance in presence of noise; ITC experiments

Towards the end of the semester, students (in groups of two) are expected to submit a mini-project using suitable Hardware OR using Matlab/labVIEW platform. The complexity of the mini-project is that of about three experiments.

TEXT BOOK:

Digtal Communications By Simon Haykins –John Wiley 2003

REFERENCE BOOKS:

1. Digital and Analog Communication by K Sam Shanmugham, John Wiley
2. Analog and Digital communications by Simon Haykins –John Wiley

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TRANSMISSION LINES & ANTENNAS
10TC6DCTLA

Objective:

ability to apply knowledge of partial differential equations to transmission lines and analyse for various cases

ability to identify, formulate and solve problems involving primary and secondary constants

ability to apply the knowledge of transmission line concepts and use Smith chart for impedance matching

ability to identify, formulate and solve problems using antenna parameters

ability to analyze power radiated and radiation resistance for dipole and loop antennas

ability to design antenna considering gain, directivity, power, bandwidth, cost

Prerequisites:

09MA**2**ICMAT	Engineering Mathematics-II
11ES**4**GCFTH	Field Theory

UNIT I **[10 hours]**

TRANSMISSION – LINE THEORY: The transmission Line-general solution, The distortion less Line, Reflection on a Line not terminated in Z0, Open and short circuited Lines, Reflection loss, Insertion loss, T and PI sections equivalent to Lines, Constant K LPF & HPF, Constants for the Line of zero dissipation, Standing waves; nodes; standing wave ratio.

UNIT II **[10 hours]**

THE LINE AT RADIO FREQUENCIES: Input impedance of open and short circuited Lines, The quarter wave Line; impedance matching, single stub impedance matching on a Line. The smith circle diagram, Application of the Smith chart, Double stub impedance, Open and Short circuit impedances when considering dissipation.

UNIT III **[11 hours]**

ANTENNA BASICS: Introduction, basic Antenna parameters, patterns, beam area, radiation intensity, beam efficiency, directivity and gain, antenna apertures, effective height, radiation efficiency, Friss transmission formula and antenna field zones.

POINT SOURCES AND ARRAYS: Introduction, point sources, power patterns, power theorem, radiation intensity, field patterns, phase patterns. Array of two isotropic point sources, non-isotropic but similar point sources, principles of pattern multiplication, onisotropic point sources, broad side array with non uniform amplitude distribution, direction of maxima for arrays of n isotropic point sources of equal amplitude and spacing

UNIT IV **[11 hours]**

ELECTRIC DIPOLES, LOOP AND THIN LINEAR ANTENNAS: Introduction, short electric dipole, fields of a short dipole, radiation resistance of short dipole, radiation resistances of lambda/2 Antenna, small loop, comparison of far fields of small loop and short dipole, loop antenna general case, far field patterns of circular loop, radiation resistance, directivity, thin linear antenna, folded dipole antennas.

UNIT V **[10 hours]**

ANTENNA TYPES: Patch antennas, slot antenna, Babinet's principle and complementary antennas, Horn antennas, Helical Antenna, Yagi-Uda array, corner reflectors, parabolic reflectors, log periodic antenna, lens antenna, Omni directional antennas, embedded antennas, ultra wide band antennas, plasma antenna. antennas for satellite and for ground penetrating radars. (Note: No derivations for the topics in this section).

Students will be expected to submit programming based assignments which will carry 10% weightage of CIE.

TEXT BOOKS:

1. Network Lines and Fields - John D Ryder, 2e, PHI, 2003.
2. Antennas, John D. Krauss, III (SEI) edition, McGraw-Hill International edition, 2006.

REFERENCE BOOKS:

1. Antenna Theory Analysis and Design - C A Balanis, 2nd ED, John Wiley, 1997.
2. Antennas and wave propagation - G S N Raju: Pearson Education 2005.
3. Antennas and Wave Propagation - Harish and Sachidananda: Oxford Press 2007.
4. Antennas and wave propagation – K D Prasad,

COMPUTER COMMUNICATION AND NETWORKING
11TC6DCCCN

Objective:

Ability to apply knowledge of state-of-the-art in network protocols, architectures, and applications.

Ability to differentiate collisions and broadcasting domains as well as utilize various devices.

Ability to apply knowledge of computers, software, networking technologies, and information assurance to an organization's management.

Ability to design and analyze the Variable size framing protocols.

Ability to design and analyze the unicast and multicast routing protocols.

Prerequisites:

11ES**3**GCDEC	Digital Electronics
10TC**5**DCDSS	Digital Switching Systems

UNIT I [10 hours]

INTRODUCTION: Uses of computer networks, Layered tasks, OSI Model, Layers in OSI model, Functions, TCP/IP Suite, Addressing. Data communication, Circuit Switching, Packet Switching, Network Models, Example Networks

UNIT II [12 hours]

DATA LINK CONTROL: Framing, Flow and error control, Protocols, Noiseless channels: Simplest protocol, Stop and wait protocol, Noisy channels: Stop and wait protocol ARQ, piggy backing, Go-Back-N ARQ, sliding window protocol, Selective repeat ARQ, HDLC, Point to point protocol.

Multiple accesses control: Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA, Controlled access: Reservation, Polling, and Token passing

UNIT III **[10 hours]**

MEDIUM ACCESS SUB LAYER:

Static and dynamic channel allocation, LAN/MAN technology, Bus/Tree, Star and Ring topologies, LAN/MAN standards, IEEE 802.2, 802.3, 802.4, IEEE802.5, 802.6, 802.11, and 802.16, Blue tooth

UNIT IV **[10 hours]**

NETWORK LAYER: Unicast Routing Protocols, Multicast Routing protocols, Logical addressing, Ipv4, Ipv6 format & addressing, Transition from Ipv4 to Ipv6, Delivery, Forwarding

UNIT V **[10 hours]**

TRANSPORT LAYER: Transport layer Process to process Delivery, UDP, TCP, SCTP, Congestion, Congestion Control, Examples, QOS, and Techniques to improve QOS. **APPLICATION LAYER:** Client Server Model, Domain Name Space (DNS), Electronic mail, HTTP, World Wide Web (WWW)

Students a are expected to submit Mini-Project which accounts for 10% of CIE

TEXT BOOK:

1. Data communication and networking– Behrouz A. Forouzan, 4th Ed, TMH 2006.
2. William Stallings, Data and Computer Communications, Fifth edition, PHI, 1998.
3. Computer networks – Andrew. S. Tannenbaum

REFERENCE BOOK:

1. Data communication and networking– Behrouz A. Forouzan, 3rd Ed, TMH 2006

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INFORMATION THEORY & CODING
10TC6DCITC

Objective:

Ability to apply knowledge of probability theory to measure the amount of information content in the message.

Ability to design communication channel with and without noise considering the capacity and efficiency.

Ability to design linear block code and their relationship to the error-detecting and error-correcting abilities.

Able to relate generating and control matrices of a cyclic code with its generating and control polynomials

Prerequisites:

11ES**3**GCDEC	Digital Electronics
11MA**4**ICMAT	Engineering Mathematics –IV

UNIT I [10 hours]

INFORMATION THEORY: Introduction, Measure of information, (Entropy) Average information content of symbols in long independent sequences, Joint Entropy and conditional entropy, Mutual information, Relationship between entropy and mutual information, Mark-off statistical model for information source, Entropy and information rate of mark-off source. Problems.

UNIT II [10 hours]

SOURCE CODING: Encoding of the source output, Kraft inequality, Noiseless coding Theorem, Shannon's encoding algorithm, Shannon's Fano encoding algorithm. Huffman coding, problems.

UNIT III [11 hours]

COMMUNICATION CHANNELS: Discrete communication channels, Representation of channels, Channel Capacity, Shannon's Theorem on channel capacity, Channel efficiency, Binary channel, Binary symmetric channel, Binary Erasure channel, Cascaded channel, Problem Continuous channels: Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem.

UNIT IV **[11 hours]**

ERROR CONTROL CODING: Introduction, Types of errors, Types of codes : Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding, Binary Cyclic Codes: Algebraic structures of cyclic codes, Encoding using an (n-k) bit register, Syndrome calculation, Problems

UNIT V **[10 hours]**

CONVOLUTION CODES: Encoder for Convolution Codes: Using Time domain approach, Using Transform domain approach, State Diagram and code trees. RS codes, Golay codes, shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes.

Introduction to Turbo Codes

TEXT BOOK:

1. Digital and analog communication systems – K. Sam Shanmugam, John Wiley, 1996.

REFERENCE BOOKS:

1. Digital communication – Simon Haykin, John Wiley, 2003.

2. Elements of information theory – Thomas M. Cover, John Wiley, 2006

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MICROWAVE & RADAR
11TC7DCMWR

Objective:

ability to apply knowledge of electromagnetic theory to waveguides, coaxial line and planar transmission lines

ability to apply the knowledge of scattering parameters to analyze the behavior of microwave passive devices.

ability to apply the knowledge of semiconductor principles for the high frequency operation of active devices

ability to identify, formulate and solve problems in radar systems

ability to apply knowledge of microwave equipment and measurement of microwave quantities considering power, impedance, standing wave ratio , frequency and S-parameters

Prerequisites:

11ES**4**GCFTH	Field Theory
10TC**6**DCTLA	Transmission Lines & Antennas

UNIT I **[08 hours]**

MICROWAVE TRANSMISSION LINES:

Introduction to microwaves, Primary constants of a transmission line, Secondary constants, Characteristic impedance, SWR, Types of waveguides, various modes of waveguides, Propagation constant, Attenuation and phase constants, Wavelength, Velocity of propagation and Group velocity, Co-axial line, Modern Transmission lines- Microstrip line, Loss in Micro strip line, Strip line, Co-planar line

UNIT II **[08 hours]**

MICROWAVE NETWORK THEORY AND PASSIVE DEVICES :

Scattering parameters, Properties of S matrix, Microwave components: waveguide terminations, Construction, Operation and parameters of Tee junctions, Directional coupler, Isolator, Phase shifter, Attenuators, co-axial connectors and adapters, Microstrip Antennas

UNIT III **[08 hours]**

MICROWAVE ACTIVE DEVICES:

Reflex Klystron, RWH theory, Gunn diode-Construction, JE characteristics, four frequency modes, Gunn waveguide oscillator, READ diode, IMPATT diode, TRAPATT diode, BARITT diode, PIN diode, Schottky diode, varactor diode, Parametric amplifiers, Microwave bipolar transistors, Unipolar FET, Microwave transistor oscillator

UNIT IV **[08 hours]**

RADAR : Basic Radar, The simple form of the Radar equation, Radar block diagram, Radar frequencies, application of Radar, Introduction to Doppler and MTI Radar, delay line Cancellers, digital MTI processing, Moving target detector, pulse Doppler Radar.

UNIT V **[07 hours]**

MICROWAVE MEASUREMENTS AND APPLICATIONS: Measurement of microwave power, frequency, losses, VSWR and Impedance using waveguides and striplines or microstrip lines, Microwave communication, Other applications

TEXT BOOKS:

1. **Microwave Engineering –** Annapurna Das, Sisir K Das TMH Publication, 2nd Edition, 2010.
2 **Introduction to Radar systems-**Merrill I Skolnik, 3rd Ed, TMH, 2001.

REFERENCE BOOKS:

1. **Microwave Devices and circuits-** Liao / Pearson Education, Third edition.
2. **Microwave and radar Engineering-** M.Kulkarni, Umesh Publications, first edition.

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OPTICAL FIBER COMMUNICATION
11TC7DCOFC

Objective:

Ability to apply knowledge of physics in ray propagation mechanism.

Ability to conduct and analyze experiments to find different losses and Numerical aperture in optical fiber

Ability to design optical power loss model for a point to point link

Ability to identify and solve problems in analog and digital optical links

Prerequisites:

09PY**2**ICPHY	Engineering Physics
11ES**3**GCAEC	Analog Electronic Circuits

UNIT I [07 hours]

INTRODUCTION TO OPTICAL FIBER COMMUNICATION: Introduction, general system, advantages, disadvantages and applications of optical fiber communication, optical fiber waveguides, Ray theory, single mode fiber, cutoff wave length, mode filed diameter ,group velocity, phase velocity, group delay , Preparation of optical fibres.

UNIT II [12 hours]

TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS: Introduction, Attenuation, absorption, scattering losses, bending loss, dispersion, Intra model dispersion, Inter model dispersion.

OPTICAL SOURCES AND DETECTORS: Introduction, LASER diodes, LED's, Photo detectors : Device Types, Principles, Absorption coefficient, Efficiency, Responsivity, Photo diodes without internal gain, Avalanche photodiodes.

UNIT III [07hours]

FIBER COUPLERS AND CONNECTORS: Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers. OPTICAL RECEIVER: Introduction, Optical Receiver Operation, Noise, analog receiver sensitivity.

UNIT IV [06 hours]

ANALOG AND DIGITAL LINKS: Analog links – Introduction, overview of analog links, CNR, multichannel transmission techniques, Digital links – Introduction, point– to–point links, System considerations, link and rise time power budget analysis.

UNIT V **[07 hours]**

INTRODUCTION TO OPTICAL NETWORKS: WDM Concepts, Multiplexers, Optical amplifiers, couplers & connectors, SONET/SDH, Optical interfaces

TEXT BOOKS:

1. Optical fiber communication- Gerd Keiser, 4th Edition, MGH, 2008
2. Optical fiber communications – John.M.Senior, Pearson Education, 3rd Impression, 2007

WIRELESS COMMUNICATION
11TC7DCWCM

Objective:

ability to apply knowledge of simple mathematics in mobile communication

ability to evaluate design criteria's and analyze problems in Cellular architectures

ability to identify cellular network models considering power, bandwidth, and cost

acquire knowledge on continuously evolving mobile communication technologies such as 3G

Prerequisites:

10TC**5**DCACM	Analog Communication
10TC**6**DCDCM	Digital Communication
10TC**6**DCTLA	Transmission Lines & Antennas

UNIT I **[8 hours]**

Introduction to wireless communication systems and networks: Evolution of mobile radio communication ,Examples of wireless communication, Different generations of wireless cellular networks 1G,2G ,2.5G, 3G, 4G Cellular system and beyond.

UNIT II **[8 hours]**

The cellular concept - system design fundamentals: Introduction, frequency reuse, channel assignment strategies, handoff strategies, trunking & grade of service, Interference & system capacity , Improving coverage and Capacity in cellular systems

UNIT III **[7 hours]**

Mobile Radio Propagation: Large scale path loss- Introduction to radio wave propagation , Free space propagation model, Relating power to electric field, Basic propagation mechanisms, Reflection, Ground reflection model, Diffraction, Scattering, Outdoor propagation model- Okumura model, Hata model

UNIT IV **[9 hours]**

GSM Technology: GSM system overview- Introduction to GSM & TDMA, GSM network and system architecture, GSM channel concept, GSM system operations- GSM identities, GSM system operations(traffic cases) , GSM infrastructures communications

UNIT V **[7 hours]**

CDMA Technology: CDMA system overview - Introduction to CDMA, CDMA network and architecture, CDMA channel concept

Experiments

Part A: Microwave & Optical Communication

Part B: Wireless communication using NS-II/Matlab/LabVIEW/Qualnet

Text Books:

1. Gary J Mullet ,'Introduction to Wireless Telecommunication Systems and Networks', Cengage Learning.
2. Theodore S Rappaport, 'Wireless communication: Principles and Practice', PHI, 2nd Edition.

Reference:

1. Vijay K Garg, 'Principles and applications of GSM',Pearson.
2. William C Y Lee, 'Wireless and cellular Telecommunications', McGraw Hill Publications, 3rd Edition.

PROJECT WORK-I
11ES7DCPW1

Objectives :

To identify, formulate and solve problems by applying the knowledge of Mathematics and Engineering in the electronics and communication domain.

ability to work in teams leading to improvement in team work and leadership qualities

Ability to come out with different alternatives to solve their problem. These alternatives should include emerging technologies and their associated cost etc

To develop team work and communication skills by the oral presentation on the work carried out.

Use project management tools such as Gantt Charts created with MS Project.

Ability to test, debug, and verify that the design meets the desired specifications.

To emphasize the need for professional and ethical responsibility, if the work leads to a technical conference/journal paper

Project Evaluation

Students in groups of 2-4 are allowed to implement a project. For each project group, one faculty supervisor is assigned to guide and monitor the progress. In addition, the department constitutes the Project Evaluation Committee (PEC) comprising three faculty members to ensure uniform evaluation for all project groups.

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INTELLECTUAL PROPERTY RIGHTS
11HS8GCIPR

Objective

ability to work in multiple teams to understand Patents, Rights conferred on a Patentee, Copy right and Trademarks leading to improvement in team work and leadership qualities.

ability to identify, formulate and solve problems on Patent law, the legislative provisions regulating patents, principles and procedure for obtaining patent.

ability to apply technical concepts of IP related technology to give an insight into IP management, Licensing, Valuation, Audit and other aspects of IP

UNIT I **[05 hours]**

Basic principles of IP laws: Introduction, Concept of property, Need for a holistic approach, Constitutional aspects of IP, Evolution of the patent system in UK, US and India, Basis for protection, Invention, Criteria for patentability, Non – patentable inventions.

UNIT II **[05 hours]**

Patents: Introduction, Origin and meaning of the term patent, Objective of a patent law, the legislative provisions regulating patents, principles underlying the patent law in India, patentable invention.

Procedure for obtaining patent: Submission of application, Filing provisional and complete specification, Examination of the application, advertisement of the acceptance, opposition, Grant and sealing of patent, Term of the patent, compulsory license. Provisional and complete specification: Definition of Specification, Kinds of specification, provisional specification, complete specification, Claims, Conditions for amendment.

UNIT III **[06 hours]**

Rights conferred on a patentee: Patent rights, Exception and limitations, Duties of a Patentee.

Transfer of patent: Forms of transfer of Patent rights, Assignment, kinds of assignment, License, kinds of license, Rights conferred on a licensee, Transmission of patent by operation of law.

Infringement of patents: Construction of claims and infringement, patents held to be infringed, patents held to be not infringed.

Action for Infringement: Where a suit is to be instituted, procedure followed in the suit, Onus of establishment infringement, Defence by the defendant, The Relief's, Injunction, Damages or account of profits, patent agents, patent drafting, database searching, and Case studies.

UNIT IV [06 hours]

Copy Right: Meaning and characteristics of copy right, Indian copy right law, requirement of copy right, Illustrations copy right in literary work, Musical work, Artistic work, work of architecture, Cinematograph film, sound recording.

Author and Ownership of copy right: Ownership of copy right, Contract of service, Contract for service, rights conferred by copy right, terms of copy right, license of copy right.

Infringement of copy right: Acts which constitute infringement, general principle, direct and indirect evidence of copying, Acts not constituting infringements, Infringements in literary, dramatic and musical works, Remedies against infringement of copy right, Case studies.

UNIT V [04 hours]

Trade Marks: Introduction, Statutory authorities, procedure of registration of trade marks,rights conferred by registration of trade marks, licensing in trade mark, infringement of trade mark and action against infringement.

TEXT BOOKS:

1. Dr. T Ramakrishna, **"Basic principles and acquisition of Intellectual Property Rights",** CIPRA, NSLIU -2005.
2. Dr.B.L.Wadehhra, **" Intellectual Property Law Handbook"**, Universal Law Publishing Co. Ltd., 2002.

REFERENCE BOOKS:

1. Dr. T Ramakrishna , **"Ownership and Enforcement of Intellectual Property Rights"** , CIPRA, NSLIU -2005.
2. **"Intellectual Property Law (Bare Act with short comments)",**Universal Law Publishing Co. Ltd.. 2007.
3. **"The Trade marks Act 1999 (Bare Act with short comments)",** Universal Law Publishing Co. Ltd., 2005.

4. **"The Patents Act, 1970 (Bare Act with short comments), as amended by Patents (Amendment) Rules 2006 w.e.f. 5-5-2006".** Commercial law publishers (India) Pvt. Ltd., 2006.
5. Thomas T Gordon and Arthur S Cookfair, **"Patent Fundamentals for Scientist and Engineers",** CRC Press 1995.
6. Prabuddha Ganguli, **"Intellectual Property Rights",** TMH Publishing Co. Ltd, 2001

PROJECT MANAGEMENT
11HS8GCPRM

Objectives :

ability to design, conduct and analyze projects, track costs and time expenditures, manage quality and risk, evaluate human resources requirements and overcome potential obstacles

ability to work in multiple teams to perform one common characteristic – the projection of ideas and activities into new endeavors.

ability to identify, control and coordinate the complex and diverse activities of modern industrial and commercial projects.

UNIT I [06 hours]

Concepts of Project Management: Concept of Project, Categories of Projects, Project Life Cycle Phases, Project Management Concepts, Tools and Techniques for Project Management, The Project Manager, Basic Education for a Project Manager, Roles and Responsibilities of Project Manager, Project Manager as a Profession, Summary.

UNIT II 05 hours]

Establishing the Project: Scope, Time, Cost and Performance Goals , Feasibility Report, Financing Arrangements, Preparation of Cost Estimates, Finalization of Project Implementation Schedule, Evaluation of the Project Profitability, Appointing a Project Manager, Fixing the Zero Date, Summary.

UNIT III **[05 hours]**

Organizing Human Resources and Contracting, Delegation, Project Manager's Authority, Project Organization, Accountability in Project Execution, Contracts, 'R's of Contracting, Tendering and Selection of Contractors, Team Building, Summary.

UNIT IV **[05 hours]**

Organizing Systems and Procedures for Project Implementation, Working of Systems, Design of Systems, Project Work System Design, Work Breakdown Structure (WBS), Project Execution Plan (PEP), Project Procedure Manual, Project Control System, Planning, Scheduling and Monitoring, Monitoring Contracts, Project Diary, Summary.

UNIT V **[05 hours]**

Project Direction, Coordination and Control, Communications in a Project, Project Coordination, Project Control, Scope/Progress Control, performance control, Schedule Control, Cost Control, Summary.

TEXT BOOK:

Project Management – S Choudary, Tata McGRAW Hill Publishing Company Limited

REFERENCE BOOKS:

1. Project management – David I Cleland – Mcgraw Hill International Edition, 1999.
2. Project Management – Gopalakrishnan – Mcmillan India Ltd.
3. Project Management – Harry-Maylor-Peason Publication.

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SEMINAR
11TC8DCSMR

Objectives :

Ability to develop communication skills in both technical and non-technical environment.

To identify the latest topics in the field of Electronics and Communication Engineering

To emphasize the need for professional and ethical responsibility, if the study leads to a technical conference/journal paper

Student Task:

The technical seminar presentation requires students to present from recent (within one year) IEEE/IET Journals/Transactions.

This is an individual presentation for 15 minutes.

A copy of the seminar report is to be submitted to each member of the SEC one week before the presentation.

One day before the seminar, a copy of the presentation handout is to be given to each member of the SEC.

Seminar Evaluation:

Student seminars are evaluated by the Seminar Evaluation Committee (SEC) constituted by department. It comprises minimum three faculty members from the department. The evaluation is as based on assessing the following:

Selection of topic from recent Journals

Seminar as a whole

Clarity of presentation

Use of audio-visual aids

Makes an interesting presentation

Management of allocated time

Ability to answer questions posed by audience

Each member of the SEC evaluates on the above parameters. The average constitutes the CIE.

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PROJECT WORK - II
11ES8DCPW2

Objectives :

To identify, formulate and solve problems by applying the knowledge of Mathematics and Engineering in the electronics and communication domain.

ability to work in teams leading to improvement in team work and leadership qualities

Ability to come out with different alternatives to solve their problem. These alternatives should include emerging technologies and their associated cost etc

To develop team work and communication skills by the oral presentation on the work carried out.

Use project management tools such as Gantt Charts created with MS Project.

Ability to test, debug, and verify that the design meets the desired specifications.

To emphasize the need for professional and ethical responsibility, if the work leads to a technical conference/journal paper

Project Evaluation

Students in groups of 2-4 are allowed to implement a project. For each project group, one faculty supervisor is assigned to guide and monitor the progress. In addition, the department constitutes the Project Evaluation Committee (PEC) comprising three faculty members to ensure uniform evaluation for all project groups.

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OBJECT ORIENTED PROGRAMMING USING C++

12ES5GE1OP

Objective:

- Ability to apply the concepts of Object Oriented Programming with emphasis on C++
- Ability to design and analyze real life applications by writing efficient programs to implement various modules considering constraints such as memory and portability.
- Emphasize the importance of Classes, Objects, Data Abstraction, Data encapsulation, Overloading, Inheritance, Polymorphism and Reusability
- Impart education to understand the need for life-long learning in the area of software engineering/programming

UNIT I [10 hours]

Principles of Object oriented programming: OOP Concepts, Program construction, directives, preprocessor directives, header files and library files, Benefits and applications Beginning with C++: Definition, application, structure of C++ program, compiling and linking Tokens, expressions and control structures: Tokens, keywords, identifiers and constants, data types, symbolic constants, variables, operators, manipulators, control statements and loops.

UNIT II [10 hours]

Functions in C++: Function prototype, argument passing, recursion, inline functions, friend and virtual functions Classes and objects: Class definition and declaration, member functions, static data members and member functions, arrays of objects, returning objects.

UNIT III [10 hours]

Constructors and destructors: Constructors, parameterized constructors, multiple constructors in a class, copy constructor, dynamic constructors, and destructors. Operator overloading and type conversions: Overloading unary and binary operators, overloading using friends, rules for overloading.

UNIT IV **[12 hours]**

Inheritance: Inheritance, public, private and protected inheritance. Private member inheritance. Types of inheritance: Single, Multilevel, multiple, hierarchical, hybrid. Pointers, virtual functions and polymorphism. Pointers, pointers to objects, this pointer, pointers to derived classes, virtual functions. Constructors in derived class. Managing console I/O operations: C++ streams, C++ stream classes, I/O operations, managing O/P with manipulators.

UNIT V **[10 hours]**

Templates: Class templates, function templates, overloading template functions, member function templates and non type template arguments. Exception handling: Basics, throwing and catching mechanisms, rethrowing an exception, specifying exceptions.

TEXT BOOKS:

1. **Object oriented Programming with C++,** -E Balagurusamy (TMH Publications, 4th edn)
2. **Object oriented Programming in turbo C++**,Robert Lafore (GALGOTIA Publications)

REFERENCE BOOK:

1 **Let Us C++--**Yashavanth P. Kanetkar (BPB Publications)
Programming With C++-----Schaum'sseries (TMH Publications)
2 **Programming With C++-----**Schaum'sseries (TMH Publications)

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DIGITAL SYSTEM DESIGN USING VHDL

12ES5GE1DD *(Except EE)*

Objective:

- Ability to design, conduct and analyze experiments in the field of Digital Electronics using software tools.
- ability to work in teams leading to improvement in team work
- ability to identify, formulate and solve problems in Digital Electronics using VHDL
- impart education to develop Engineering solutions with an awareness of industry concerns
- ability to apply technical knowledge and use engineering tools necessary for engineering practice.

UNIT I **[10 hours]**

Introduction: VHDL description of combinational networks, Modeling flip-flops using VHDL, VHDL models for a multiplexer, Compilation and simulation of VHDL code, Modeling a sequential machine, Variables, Signals and constants, Arrays, VHDL operators, VHDL functions, VHDL procedures, Packages and libraries, VHDL model for a counter.

Additional Topics in VHDL: Attributes, Transport and Inertial delays, Operator overloading, Multi-valued logic and signal resolution, IEEE-1164 standard logic, Generics, Generate statements, Synthesis of VHDL code, Synthesis examples, Files and Text IO.

UNIT II **[08 hours]**

Designing With Programmable Logic Devices: Read-only memories, Programmable logic arrays (PLAs), Programmable array logic (PLAs), Other sequential programmable logic devices (PLDs), Design of a keypad scanner.

UNIT III **[06 hours]**

Designing With Programmable Gate Arrays And Complex Programmable Logic Devices: Xlinx 3000 series FPGAs, Designing with FPGAs, Xlinx 4000 series FPGAs, using a one-hot state assignment, Altera complex programmable logic devices (CPLDs), Altera FLEX 10K series CPLDs.

UNIT IV **[08 hours]**

Design Of Networks For Arithmetic Operations: Design of a serial adder with accumulator, State graphs for control networks, Design of a binary multiplier, Multiplication of signed binary numbers, Design of a binary divider.

UNIT V **[07 hours]**

Digital Design with SM Charts: State machine charts, Derivation of SM charts, Realization of SM charts. Implementation of the dice game, Alternative realization for SM charts using microprogramming, Linked state machines.

Laboratory Experiments:

Combinational circuits using data flow modeling, sequential modeling, structural modeling; Sequential circuits using data flow modeling, sequential modeling, structural modeling; functions; Procedures; multipliers; dividers;

TEXT BOOK:

Charles H. Roth. Jr:, Digital Systems Design using VHDL, Thomson Learning, Inc, 9th reprint, 2006.

REFERENCE BOOKS:

1. Stephen Brown & ZvonkoVranesic, Fundamentals of **Digital Logic Design with VHDL,** Tata McGrw-Hill, New Delhi, 2nd Ed., 2007
2. Mark Zwolinski, **Digital System Design with VHDL**, 2 Ed, Pearson Education., 2004
3. Volnei A Pedroni, **Circuit Design with VHDL.** PHI

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ESSENTIALS OF INFORMATION TECHNOLOGY

12ES5GE1IT

UNIT I **[07 hours]**

Introduction to Computer Systems - Basics of computer systems - Various hardware components - Data storage and various Memory units - Central Processing Unit - Execution cycle - Introduce to software and its classifications

Operating system concepts– Introduction – Memory management - Process management - Interprocess Communication – Deadlocks - File management - Device management

UNIT II **[08 hours]**

Problem solving Techniques - Introduction to problem solving - Computational problem and it's classification - Logic and its types - Introduction to algorithms - Implementation of algorithms using flowchart - Flowcharts implementation through RAPTOR tool - Searching and sorting algorithms - Introduction and classification to Data Structures - Basic Data Structures - Advanced Data Structures

UNIT III **[08 hours]**

Programming & Testing - Introduction to Programming Paradigms and Pseudo Code - Basic programming concepts - Program Life Cycle - Control Structures - Introduction and Demonstration of 1-D Array and 2-D Array - Code Optimization techniques Structured Programming – Functions – Structures - File Handling - Introduction to Software Development Life Cycle - Industry Coding Standards and Best Practices - Testing and Debugging - Code Review

UNIT IV **[08 hours]**

- **RDBMS**- data processing – the database technology – data models
- ER modeling concept –notations – Extended ER features
- Logical database design - normalization
- SQL – DDL statements – DML statements – DCL statements
- Joins - Sub queries – Views
- Database design Issues

UNIT V **[08 hours]**

Integrated Project - Project Briefing, Project contact sessions and Project evaluation. Sample exercise on using Embedded SQL /JDBC

Note: The project is a Group Activity consisting of 3/4 members in a team. The Project will be carried out offline for duration of 25-32 hours.

1. **Tutorial**

- The assignments for Operating System Concepts, Problem Solving techniques, Programming & Testing, Object Oriented Concepts and RDBMS have to be completed as a part of Tutorial.

2. **Project**

Students are required to implement an integrated project using the concepts of Programming & Testing, Object Oriented Concepts and RDBMS.

Following activities are involved in Project Development:

- Preparation of High level design and Detailed design document,
- Unit Test Plan and Integrated Test Plan
- Coding and Unit Testing , Integration Testing

Students can use the following to implement the Project:

- Programs using C or C++ or Java Language
- Embedded SQL can be used to connect the Front-End with the backend Database systems in case of C/C++
- JDBC can be used to connect Front-End with the backend Database systems in case of Java

TEXT BOOK:

Foundation Program, Volume I, II & III developed by Campus Connect initiative of Infosys

REFERENCE BOOKS:

1. Andrew S. Tanenbaum , : Structured Computer Organization , PHI, 4th edition, 1999
2. John L. Hennessy, David Goldberg, David A. Patterson, Computer Architecture : A Quantitative Approach, 2nd Edition Published by Morgan Kaufman Publishers, 1996
3. Silberschatz and Galvin, Operating System Concepts, John Wiley & Sons ,Sixth edition
4. Andrew Tanenbaum, Modern Operating Systems, Pearson Education
5. Milan Milenkovic, "Operating Systems: concepts and design", McGraw-Hill
6. Charles Crowley, "Operating Systems: A Design-Oriented Approach"
7. Dromey, R.G., How to solve it by computers, Prentice Hall, 2005
8. Alfred V.Aho, Ullman, Hopcroft, Data Structures and Algorithms, Addison-wesely.
9. Lipschutz, Seymour & G A V Pai, Data Structures, Tata McGraw – Hill
10. Baldwin, Douglas & Scragg, Greg W., Algorithms and Data Structures The Science of Computing, Dreamtech
11. Kernighan., Ritchie, ANSI C Language, Prentice Hall of India, New Delhi, 1992.
12. Yashwant Kanitker, Let Us C, by Yashwant Kanitker, Second Edition
13. Schaum series, Programming in C, Third Edition
14. Programming Pearls , by Jon Bentley, Pearson Education publication
15. Aho, Alfred V,Compiler Principles, Techniques and Tools,Pearson Education
16. Tharp Alan L, File Organization and Processing, John Willey and Sons
17. Henry F Korth, Abraham Silberschatz, "Database system concepts", Second ed., McGraw-Hill International editions, Computer Science series, 1991
18. Elmasri, Navathe, "Fundamentals of Database Systems", Third ed, Addison Wesley
19. C.J.Date ,"An introduction to Database Systems", Sixth ed, Narosa Publications

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DIGITAL CONTROL OF DYNAMIC SYSTEMS

12EC5GE1DC *(Except IT)*

UNIT I **[10 hours]**

Review of Continuous Control and Introductory Digital Control

Introduction - Review of Continuous Control - Dynamic Response - Basic Properties of Feedback - Root Locus - Frequency Response Design – Compensation - State-Space Design - **Introductory Digital Control** – Digitization - Effect of Sampling - PID Control

UNIT II **[08 hours]**

Discrete System Representation and Analysis

Discrete Systems Analysis - Linear Difference Equations - The Discrete Transfer Function - Discrete Models of Sampled-Data Systems - Signal Analysis and Dynamic Response - Frequency Response - Properties of the z-Transform - **Sampled-Data Systems** - Analysis of the Sample and Hold - Spectrum of a Sampled Signal - Data Extrapolation - Block Diagram Analysis - System Output Between Samples

UNIT III **[10 hours]**

Design of Digital Control Systems in Time Domain and Frequency Domain

Discrete Equivalents - Design via Numerical Integration - Zero-Pole Matching - Hold Equivalents - **Design Using Transform Techniques** - System Specifications - Design by Emulation - Direct Design by Root Locus in the z-Plane - Frequency Response Methods - Direct Design Method of Ragazzini – Specific case studies

UNIT IV **[10 hours]**

Design of Digital Control Systems using State Space Technique

Design Using State-Space Methods - Control Law Design - Estimator Design - Regulator Design: Control + Estimator - Reference Input - Integral Control and Disturbance Estimation - Effects of Delays - Controllability and Observability - Specific case studies -

Multivariable and Optimal Control – Decoupling - Time-varying Optimal Control - LQR Steady-State Optimal Control - Optimal Estimation - Multivariable Control Design – with Examples - Specific case studies

UNIT V **[10 hours]**

Quantization effects and parametric sensitivity

Quantization Effects - Analysis of Round-off Errors - Effects of Parameter Round-off - Limit Cycles and Dither - Sample Rate Selection - The Sampling Theorem's Limit - Time Response and Smoothness - Errors due to Random Plant Disturbances - Sensitivity to Parameter Variations - Measurement Noise and Antialiasing Filters - Multirate Sampling

TEXT BOOK:

"Digital Control of Dynamic Systems", Gene F. Franklin, J. David Powell and Michael Workman, Addison-Wesley, 3rd Edition, 1998

MEDICAL PHYSICS
12ML5GE1MP

OBJECTIVE: This subject describes usefulness of physics in understanding the behavior of human body. The syllabus covers application of physics such as heatf electricity, light, sound to medicine and physics of various organ systems such as eyes lungs, heart, and circulatory system.

OUTCOME: The students will know how the human body works and the physical principles of the instruments used in medical diagnosis and therapy.

UNIT I **[07 hours]**

Heat and Cold in Medicine: Physical Basis of Heat and temperature. Thermometry and Temperature Scales. Thermography-Mapping the Body's temperature. Heat therapy. Use of cold in Medicine. Cryosurgery, safety with Cryogenics

UNIT II **[08 hours]**

Energy, Work and Power of the Body: Conservation of Energy in the Body, Energy changes in the body, Work and Power, Heat losses from the Body.

Pressure: Measurement of Pressure in the body, Pressure inside the Skull, Eye Pressure, Pressure in Digestive system, Pressure in the skeleton, Pressure in urinary bladder, Pressure effects while Diving, Hyperbaric Oxygen Therapy (HOT)

UNIT III **[07 hours]**

The Physics of the Lungs and Breathing: The Airways, How the blood and lungs interact, Measurement of Lung volumes, Pressure-Airflow-Volume relationships of the Lungs, Physics of alveoli, The breathing mechanism, Airway Resistance, Work of breathing, Physics of some common lung diseases.

UNIT IV **[10 hours]**

Physics of the Cardiovascular System: major components of the Cardiovascular system. O2 and CO2 exchange in the capillary system, work done by the Heart, Blood Pressure and its Measurement, Pressure across the blood vessel wall (Transmural Pressure), Bernoulli's Principal applied to the cardiovascular system. Blood Flow- Laminar and Turbulent, Heart sounds, the physics of some cardiovascular diseases.

Applications of Electricity and Magnetism in Medicine: Electric shock, High frequency electricity in Medicine, Low frequency electricity and Magnetism in Medicine.

UNIT V **[10 hours]**

Sound in Medicine: General properties of sound, the body as a drum, The stethoscope, Ultrasound pictures of the body, Ultrasound to measure motion, Physiological effects of Ultrasound in therapy, The production of Speech (Phonation). The structure of Ear, Sensitivity of Ear, testing your hearing deafness and Hearing aids.

Light in medicine: measurement of visible Light and its units, Application of Visible light in Medicine, Application of Ultravoilet and Infrared light in Medicine, Lasers in Medicine, Application of Microscopes in Medicine. Focussing Elements of the Eye, The structure and functioning elements of the eye, Diffraction effects of the Eye, Optical illusions and related phenomena, Defective vision and its correction, Color vision and Chromatic aberration, Instruments used in Ophthalmology.

TEXT BOOK:

1. MEDICAL PHYSICS - by John R Cameron, James G Skofronick, A Wiley- Interscience Publication.

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(Autonomous College under VTU)

DATA STRUCTURES WITH C++

10ML5GE1DS (Except ML)

The objective: To introduce the fundamentals of Data Structures, Abstract concepts and how these concepts are useful in problem solving. Analyze step by step and develop algorithms to solve real world problems.

UNIT I [08 hours]

C++ programming Basics: Need of object oriented programming, procedural languages, characteristics of OOP, preprocessor directives, data types, manipulators. Structures: Structures, enumerated data types, Boolean type, Functions: passing arguments, returning values, reference arguments, overloaded functions, inline functions, variable and storage classes.

UNIT II [07 hours]

Objects and classes: objects as data types, constructors, destructors, overloaded constructors. Arrays: Arrays as class member data types, passing arrays, arrays as objects, strings, arrays of strings.

UNIT III [07 hours]

Operator overloading: over loading of unary operators, binary operators, data conversion.

Inheritance: Inheritance, derived class and base class, overriding member functions, scope resolution, levels of inheritance, multiple inheritances.

UNIT IV [07 hours]

Pointers, pointers to objects, linked list, virtual functions, static functions, Working with files: Introduction, Classes for the stream operators, opening and closing files, detecting end-of-file, more about open( ); file modes, file pointers and their manipulations, sequential input and output operations, Updating a file: Random access, error handling during file operation.

UNIT V **[10 hours]**

Data structures: data representation, matrices, stacks, Queues

Lab experiments

Lab components must comprise of experiments that reinforce the theoretical understanding of the corresponding subject. Experiments would address concepts of Structures, Classes, Objects, Operator overloading, Inheritance, File I/O. Stacks and Queues.

TEXT BOOKS:

1. **Object oriented programming in TURBO C++,** Robert Lafore, Galgotia Publications.2002
2. **Data Structures using C++**, D.S.Malik, Thomson, 2003

REFERENCE BOOKS:

1. **Object Oriented Programming with C++,** E Balaguruswamy, Third edition, TMH2006
2. **C++ the complete reference,** Herbert Schildt, Fourth edition, TMH, 2003
3. **Data Structures, Algorithms and Applications in C++:** SartajSahni, Tata McGrawHill Publications.

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COMMUNICATION SYSTEMS (EE ONLY)

10EE5GE1CS

Objectives:

This course provides an understanding of communication theory as applied to the transmission of information bearing signals with equal emphasis and attention given to both analog and digital communication techniques.

UNIT I **[12 hours]**

Amplitude modulation: Time-Domain Description, Frequency domain description, Generation of AM waves, Detection of AM waves, AM/DSB, Time-Domain Description, Frequency domain description Generation of DSBSC waves, Coherent Detection of DSBSC Modulated waves. Costas loop, Quadrature Carrier multiplexing, AM-SSB/SC generation, Frequency-Domain Description, Frequency discrimination method for generation an SSB Modulated wave, time domain description, phase discrimination method for generating an SSB modulated wave, Demodulation of SSB waves, Comparison of amplitude modulation techniques, frequency translation, FDM.

UNIT II **[07 hours]**

Angle modulation: Basic Concepts, Frequency Modulation, Spectrum Analysis Of sinusoidal FM wave, NBFM, WBFM, Constant Average power, Transmission bandwidth of FM waves, Generation of FM waves, Direct FM, demodulation of FM waves, frequency discriminator, ZCD, phase locked loop (1st order) of AM and FM.

UNIT III **[07 hours]**

Noise in Analog modulation systems: Signal-to-noise ratios, AM receiver model, Signal-to - noise ratios for coherent reception, DSBSC receiver, SSB receiver, noise in AM receivers using envelope detection, threshold effect, FM receiver model, noise in FM reception, FM threshold effect, pre-emphasis and de-emphasis in FM systems.

UNIT IV **[12 hours]**

Pulse modulation : Sampling theorem for low-pass and band-pass signal, statement and proof, PAM, Channel bandwidth for a PAM signal, natural sampling, flat-top sampling, signal recovery through holding, quantization of signals, quantization error, PCM, electrical representations of binary digits, PCM systems, DPCM, delta Modulation, Adaptive delta modulation.

UNIT V **[14 hours]**

Digital Modulation: Introduction, Binary Shift Keying, DPSK, QPSK, Type D flip-flop, QPSK transmitter, non-offset QPSK, QPSK receiver, signal - space representation, BFSK, spectrum, receiver for BFSK, geometrical representation of orthogonal BFSK, line codes, TDM.

TEXT BOOKS:

1. **"Analog and Digital communication",** Simon Haykin, John Wiley.
2. **"Principles of communication systems",** Taub and Schilling, Tata McGraw Hill.

REFERENCE BOOKS:

1. **"Electronic Communication Systems",** 2nd Edition, Blake, Thomson publishers.
2. **"Electronic Communication Systems",** George Kennedy.

FUNDAMENTALS OF HDL (EE ONLY)
12EE5GE1HD

UNIT I **[07hours]**

Introduction: Why HDL? , A Brief History of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions, simulation and synthesis, Brief comparison of VHDL and Verilog

UNIT II **[08hours]**

Data-Flow Descriptions: Highlights of Data-Flow Descriptions, Structure of Data-Flow Description, Data Type – Vectors. Behavioral Descriptions: Behavioral Description highlights, structure of HDL behavioral Description, The VHDL variable –Assignment Statement, sequential statements.

UNIT III **[08 hours]**

Structural Descriptions: Highlights of structural Description, Organization of the structural Descriptions, Binding, state Machines, Generate, Generic, and Parameter statements.

UNIT IV **[08 hours]**

Procedures and Functions: Procedures, Tasks, and Functions: Highlights of Procedures, tasks, and Functions, Procedures and tasks, Functions. Advanced HDL Descriptions: File Processing, Examples of File Processing.

UNIT V **[08 hours]**

Synthesis Basics: Highlights of Synthesis, Synthesis information from Entity and Module, Mapping Process and Always in the Hardware Domain.

LAB Experiments

Combinational logic circuits, sequential circuits using data flow (simulation and implementing using FPGA/CPLD) sequential descriptions & structural descriptions. Interfacing experiments : stepper motor, dc motor, relay, waveform generation.

TEXT BOOK:

HDL Programming (VHDL and Verilog)- Nazeih M.Botros- Dreamtech Press (Available through John Wiley – India and Thomson Learning), 2006 Edition

REFERENCE BOOKS:

1. Verilog HDL –Samir Palnitkar, Pearson Education
2. VHDL –Douglas Perry,TMH
3. Fundamentals of Digital Logic with Verilog Design-Stephen Brow TMH
4. Circuit Design with VHDL-Volnei A.Pedroni, PHI

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FUNDAMENTALS OF VLSI (EE ONLY)

10EE6GE2FV

Objective

Use of VLSI technology has increased in recent past. With the advent of power semiconductor devices, most of the large circuits have been replaced by small and compact VLSI circuits.

UNIT I **[10 hours]**

A Review of Microelectronics and an Introduction To Mos Technology: Introduction to integrated circuit technology, Production of E-beam masks. Introduction, VLSI technologies, MOS transistors, fabrication, thermal aspects, production of E-beam masks.

UNIT II **[10 hours]**

Basic Electrical Properties of Mos an Bicmos Circuit: Drain to source current Ids versus Vds relationships-BICMOS latch up susceptibility. MOS transistor characteristics, figure of merit, pass transistor NMOS and COMS inverters, circuit model, latch up.

UNIT III **[08 hours]**

Mos And Bicmos Circuit Design Processes: Mass layers, stick diagrams, design, symbolic diagrams.

UNIT IV **[14 hours]**

A) Basic Circuit Concepts: Sheet resistance, standard capacitance, capacitance layer, inverter delays, wiring capacitance, choice of layers.

B) Scaling of Mos Circuits: Scaling model and scaling factors- Limit due to current density.

UNIT V **[10 hours]**

Subsystem Design And Layout , Subsystem Design Processes : Some architecture issues- other systems considerations. amples of structural design, clocked sequential circuits . Some general considerations, an Illustration of design process**,** observations.

TEXT BOOKS:

"Basic VLSI Design" -3rd Edition, Pucknell Douglas Al , PHI

REFERENCE BOOKS:

1. **"Fundamentals of Modern VLSI Devices"-**Yuan TaunTak H Ning Cambridge Press, South Asia Edition 2003,
2. **"ModernVLSI Design Wayne wolf",** Pearson Education Inc. 3rd edition"-Wayne Wolf 2003.

UTILIZATION OF ELECTRICAL POWER
10EE6GE2UP

Objective:

- To understand the fundamentals of illumination and its classification and the electric heating and welding.
- To study Electric traction systems in detail and their practical applications.

UNIT I **[12 hours]**

Heating and welding: Advantages and methods of electric of heating, resistance ovens, inductionheating, dielectric heating, the arc furnace, heating of building, electric welding, resistance and arc welding, control device and welding equipment.

UNIT II **[08 hours]**

Electrolytic process: Fundamental principles, extraction, refining of metals, electroplating. Factors affecting electro deposition process, power supply for electrolytic process.

UNIT III **[08 hours]**

Illumination: Laws of illumination, lighting calculation, factory lighting, flood lighting, street lighting, different types of lamps, incandescent, fluorescent, vapor and CFL and their working.

UNIT IV **[12 hours]**

Introduction to Electric traction: Systems of traction, speed time curve, tractive effort, co-efficient of adhesions, specific energy, factors affecting specific energy consumption, selection of traction motors.

UNIT V **[12 hours]**

Control of Traction Motors: Methods of speed control, energy saving by series parallel control. AC series motor, characteristics, regenerative braking, linear induction motor and their use.Diesel electric equipment, train lighting system.

TEXT BOOKS:

1. J.B.Gupta, **Utilization of Electric Power and Electric Traction,** S.K Kataria and Sons
2. SoniGupta & Bhatnagar, **A Course in Electrical Power,** DhanpatRai and Sons

REFERENCE BOOK:

Openshaw Taylor**, Utilization of electric energy,** Orient Longman

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OPERATING SYSTEMS CONCEPTS

12ES6GE2OS

Objective:

- ability to apply knowledge of computers in field of Electronics & Telecommunication Engineering
- ability to identify and solve memory allocation problems in operating system
- recognize the need for operating systems in the field of telecommunication and pursue life-long learning in it

UNIT I [10 hours]

INTRODUCTION AND OVERVIEW OF OPERATING SYSTEMS: Abstract views of an Operating system, Goals of an O.S, Operation of an O.S, Efficiency, system performance and user convenience, Classes of operating systems: Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems

UNIT II [12 hours]

SCHEDULING: Preliminaries, Non-preemptive Scheduling Policies, Preemptive Scheduling Policies, Scheduling practice, Real Time Scheduling, Scheduling in Unix MEMORY MANAGEMENT: Static and Dynamic memory allocation,Memory allocation to a process, Reuse of memory, Contiguous memory allocation, Noncontiguous memory allocation, Paging, Segmentation,

UNIT III [11 hours]

VIRTUAL MEMORY: Virtual memory basics, Demand paging : overview of paging, demand paging preliminaries, page replacement, Page replacement policies, Memory allocation to process, Copy-on-write, UNIX virtual memory.

FILE SYSTEMS: File system and IOCS, Files and File Operations, Fundamental of File Organizations, Directory Structures, Allocation of disk space, Implementing file access, UNIX file system.

UNIT IV **[11 hours]**

Message Passing: Overview of message passing, Implementing message passing, Mailboxes, Message passing in Unix

Deadlocks: Definition of deadlock, Deadlock in resource allocation, Handling deadlocks, Deadlock detection and resolution, Deadlock prevention, Deadlock avoidance, Deadlock handling in practice

UNIT V **[08 hours]**

STRUCTURE OF THE OPERATING SYSTEMS: Operation of an O.S, Structure of an operating system, Operating system with monolithic structure, layered design of operating system, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems

TEXT BOOK:

"Operating Systems - A Concept based Approach", D. M. hamdhare, TMH, 2nd Ed, 2006.

REFERENCE BOOKS:

1. **Operating Systems Concepts,** Silberschatz and Galvin, John Wiley, 7th Edition, 2001.
2. **Operating System – Internals and Design Systems,** Willaim Stalling, Pearson Education, 4th Ed, 2006.

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ADVANCED MICROCONTROLLERS & APPLICATIONS

12EC6GE2MC

Objective

- To provide basic concepts of a RISC Machine(ARM) Processor
- Understand architecture, instruction set and programming both in ARM and Thumb mode
- Understand the various aspects embedded C programming and embedded system protocols

UNIT I **[08 hours]**

Migration from 8051 to 32bit cores, RISC design and ARM Design Approach, Advantages of ARM, ARM Organization, Registers, Current Program Status Registers,3 stage and 5 Stage Pipeline, Exceptions ,Interrupts and Vector Table, Co processor Interface.

UNIT II **[08 hours]**

ARM Instruction Sets, Data Processing Instructions, Branch Instructions, Load Store, Software Interrupt, Program Status Register Instructions, Thumb Instruction Sets; Thumb Register Usage, ARM-Thumb Inter-working, Cross compilers and Optimization, Overview of C compilers and Optimization, Basic C data types, C looping Structures, Function calls., Portability Issues.

UNIT III **[08 hours]**

Writing and Optimizing ARM Assembly Code, Writing Assembly Code, Instruction Scheduling, Register Allocation, Looping Constructs, Bit Manipulation, Example Programs.

UNIT IV **[05 hours]**

Firmware and Bootloader, Embedded Operating Systems, Memory Management Unit, Working With I2C SPI and USB protocols.

UNIT V **[10 hours]**

Introduction to Intel Atom Architecture

Atom Processor based Platform Overview: IA32 introduction, Platform block diagram, Atom Processor: Addressing Modes, Registers, Memory accesses and memory map, Instruction set, Segmentation, Task switching, Paging, Hyper threading, Caches and TLB, Execution pipeline, x86 legacy features, Interrupts, Intel Atom Micro architecture, Code Optimization.

LAB Experiments

Part-I

Experiment 1 : Interfacing a 7 segment display and working.

Experiment 2 : Using GPIOs on Expansion ports

Experiment 3 :Write serial communication program in C.

Experiment 4 : Interfacing and running PWM drive.

Experiment 5: Configuring and working with Audio Codec

1. Introduction to Intel Atom kit
2. Installation of OS
3. Working with GCC Compiler

Part – II

1. Introduction to Intel Atom kit
2. Installation of OS
3. Working with GCC Compiler
4. Interfacing GSM through RS-232
5. Interfacing GPS through RS-232
6. Interfacing RFID through RS-232
7. Interfacing Keyboard and Mouse using USB
8. Recording Video using USB Webcam
9. Interfacing through GPIO

TEXT BOOK:

1. ARM System Developer's Guide By Andrew N Sloss
2. ARM System-On-Chip Architecture By Steve Furber, Addison Wesley, Pearson Education, 2nd edition
3. Experiments on ARM 9 –Practical Guide ,Book By Innovate Software Solutions Pvt Ltd

REFERENCE BOOKS:

1. Jagger (Ed) ARM architectural reference manual, Prentice Hall
2. ARM assembly language an introduction by J. R. Gibson

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INTRODUCTION TO SPEECH AND AUDIO PROCESSING

10TC6GE2SA

Objective:

- Ability to apply the fundamentals of signal processing for speech and related applications
- To emphasize the need for speech analysis and speech synthesis
- To design and analyze problems in the area of application of enhancement, speech coding and speech recognition
- To conduct laboratory experiments applying the concepts of speech processing on a speech/audio sample

UNIT I **[07 hours]**

Production and classification of speech sounds: Introduction, mechanism of speech production. Acoustic phonetics: vowels, diphthongs, semivowels, nasals, fricatives, stops and affricates. DSP review. General discrete time model for speech production.

UNIT II **[08 hours]**

Time-domain methods for speech processing: Time dependent processing of speech, short-time energy and average magnitude, short-time average zero crossing rate, Speech vs. silence detection, pitch period estimation using parallel processing approach, short-time autocorrelation function.

UNIT III **[08 hours]**

Frequency domain methods for speech processing: Introduction, definitions and properties: Fourier transforms interpretation and linear filter interpretation, sampling rates in time and frequency, Filter bank summation and overlap add methods for short-time synthesis of speech, sinusoidal and harmonic plus noise method of analysis/synthesis.

UNIT IV **[08 hours]**

Linear predictive coding of speech: Basic principles of linear predictive analysis, Solution of LPC equations, Prediction error signal, Frequency domain interpretation, Relation between the various speech parameters, Synthesis of speech from linear predictive parameters, Applications

UNIT V **[08 hours]**

Homomorphic speech processing: Introduction, Homomorphic systems for convolution, the complex cepstrum of speech, pitch detection, formant estimation. The homomorphic vocoder

Lab Experiments:

Basic audio experiments, Time domain methods, frequency domain based experiments, speech estimation, speech synthesis

Mini-project

TEXT BOOKS:

1. **Digital processing of speech signals –** L. R. Rabiner and R. W. Schafer, Pearson Education Asia, 2004.
2. **Fundamentals of Multimedia –** Z. Li and M.S. Drew, Pearson Education Ltd., 2004.

REFERENCE BOOKS:

1. **Discrete time speech signal processing–** T. F. Quatieri, Pearson Education Asia, 2004.
2. **Speech and audio signal processing: processing and perception of speech and music–** B. Gold and N. Morgan, John Wiley, 2004.

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OBJECT ORIENTED PROGRAMMING USING C++ AND JAVA

12TC6GE2CJ

(Not for those who have taken 12ES5GE1OP)

Objective:

- Ability to apply the concepts of Object Oriented Programming with emphasis on C++
- Ability to design and analyze real life applications by writing efficient programs to implement various modules considering constraints such as memory and portability.
- Emphasize the importance of Classes, Objects, Data Abstraction, Data encapsulation, Overloading, Inheritance, Polymorphism and Reusability
- Impart education to understand the need for life-long learning in the area of software engineering/programming

UNIT I **[10 hours]**

Functions in C++: Function prototype, argument passing, recursion, inline functions, friend and virtual functions Classes and objects: Class definition and declaration, member functions, static data members and member functions, arrays of objects, returning objects.

UNIT II **[10 hours]**

Constructors and destructors: Constructors, parameterized constructors, multiple constructors in a class, copy constructor, dynamic constructors, and destructors. Operator overloading and type conversions: Overloading unary and binary operators, overloading using friends, rules for overloading.

UNIT III **[10 hours]**

Inheritance: Inheritance, public, private and protected inheritance. Private member inheritance. Types of inheritance: Single, Multilevel, multiple, hierarchical, hybrid. Pointers, virtual functions and polymorphism. Pointers, pointers to objects, this pointer, pointers to derived classes, virtual functions. Constructors in derived class. Managing console I/O operations: C++ streams, C++ stream classes, I/O operations, managing O/P with manipulators.

UNIT IV **[12 hours]**

Templates: Class templates, function templates, overloading template functions, member function templates and non type template arguments. Exception handling: Basics, throwing and catching mechanisms, rethrowing an exception, specifying exceptions.

UNIT V **[10 hours]**

Introduction Object Oriented Programming using Java – Object Oriented Concepts – Abstraction & Encapsulation – Relationships – Polymorphism – Interfaces and Packages

TEXT BOOKS:

1. **Object oriented Programming with C**++, -E Balagurusamy (TMH Publications, 4th edn)
2. **Object oriented Programming in turbo C**++,Robert Lafore (GALGOTIA Publications)
3. Foundation Program, Volume I, II & III developed by Campus Connect initiative of Infosys

REFERENCE BOOK:

1. **Let Us C++--**Yashavanth P. Kanetkar (BPB Publications)
   Programming With C++-----Schaum'sseries (TMH Publications)
2 **Programming With C++-----**Schaum'sseries (TMH Publications)

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BIOSENSORS

10ML6GE2SN

Objective

Understanding the components used for various biosensors and biosensor family. Principles and types of transducers. Helps to Know about the applications on clinical chemistry, healthcare and veterinary and agriculture, the usage of biosensors on environmental samples and application on Biochips and geonomics. Understanding the principles of semiconductor electrodes used for preparation of biosensors and its different types and different photometric assay techniques.

Outcome: Based on the concepts of biosensors and its types and techniques the biomedical applications can be applied in health care industry and more clinical laboratories. It helps in devising applications in clinical chemistry, veterinary applications and molecular electronics as applied to biomedical field

UNIT I [10 hours]

Introduction: Introduction to Biosensors. Advantages and limitations, various components of biosensors, the growing of biosensor.The biosensor family, the biomolecule ingredients, proteins, enzymes complexes, enzymes kinetics, the proteins of the immune systems.

UNIT II [10 hours]

Transducers in biosensors: Various types of transducers, principles and applications - Calorimetric, optical, potentiometric / amperometric, conductrometric/resistormetric, piezoelectric, semiconductor, impedimetric, mechanical and molecular electronics based transducers. Chemiluminescences - based biosensors.

UNIT III [10 hours]

Application and uses of biosensors: Biosensors in clinical chemistry, medicine and health care, biosensors for veterinary, agriculture and food. Biosensors for personal diabetes management, application of biosensors to environmental samples. Biochips and their application to genomics.

UNIT IV **[12 hours]**

Semiconductor electrodes: Measurement of H+ , Ion selective interfaces, Ion selective electrodes, semiconductor electrodes, MIS structures, semiconductor solution interface, FET, chemical sensitive FETA (CHEMFETA), suspended gate field effect transistor, selectivity via pattern recognition, Ion selective FET (ISFET)**,** reference FET, CHEMFET, assessment of CHEMFETS.

UNIT V **[10 hours]**

Photometric assay techniques: Energy transition, ultraviolet and visible absorption spectra, fluorescence and phosphorescence, infra Red transitions, light scattering, Raman scattering, applications of ultraviolet visible spectra, indicator linked bioassay, irrational spectroscopy, the optical transducer, wave guides in sensors, device construction, PH optical probes, light scattering analysis.

TEXT BOOKS:

1. Biosensors by Elizabeth A. Hall - Open University press, Milton Keynes.

2. Commercial Biosensors by Graham Ramsay, John Wiley and son, INC. (1998).

REFERENCE BOOKS:

1. **Biosensors** by Eggins

2. **Biosensors** edited by AEG CASS – OIRL press, Oxford University.

3. **Transducers and Instrumentation** by Murthy D V S. Prentice Hall, 1995

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BIOSTATISTICS

10ML6GE2BS

Objective: To Analyze Stat1st1cal Data and to offer efficient decision by apply1ng various statistical method in the Medical Field. In this course one will be able to calculate statistics and do decisions based on the results of statistics. Also one would be able to find the best statistics method to apply and come up with efficient decision.

Outcome: The student will be able to arrive at conclusions drawn from statistical analysis for Medical Data which would be helpful for the doctors and Medical practitioner for effective diagnosis and treatment.

UNIT I [08 hours]

Introduction to Biostatistics: Introduction, Some basic concepts, Measurement and Measurement Scales, Simple random sample.

Descriptive Statistics: Introduction, Ordered array, Grouped data-frequency distribution, Descriptive statistics- measure of central tendency, Measure of dispersion, measure of central tendency computed from grouped data, variance and standard deviation-grouped data.

UNIT II [10 hours]

Basic probability Concepts: Introduction, Two views of probability – Objective and Subjective, Elementary properties of Probability, Calculating the probability of an event, Bayes's Theorem, Screening Tests, Sensitivity, Specificity and Predictive Value Positive and Negative.

Probability distribution: Introduction, Probability distribution of discrete variables, binomial distribution, Poisson distribution, Continuous probability distribution, Normal distribution and applications.

Sampling distribution: Introduction, Sampling distribution, Distribution of the sample mean, Distribution of the difference between two sample means, Distribution of the sample proportion, Distribution of the difference between two sample proportions.

UNIT III **[10 hours]**

Estimation: Introduction, Confidence interval for population mean, t-distribution, Confidence interval for difference between two population means, Population proportion and difference between two population proportions, determination of sample size for estimating means and proportions, confidence interval for the variance of normally distributed population and ratio of the variances of two normally distributed populations.

UNIT IV **[12 hours]**

Hypothesis Testing: Introduction, Hypothesis testing – Single population mean, difference between two population means, paired comparisons, hypothesis testing – single population proportions, single population variance, ratio of two population variance.**Comparison of Means by three or more Samples (ANOVA) –** Technique of Analysing Variance, Procedure for calculation of F-Statistic, ANOVA for one way classification, ANOVA for one way classification for samples of unequal size, ANOVA for two way classification, F-Analysis by coding method, Missing data formulation technique for Analysis of Variance.

UNIT V **[12 hours]**

Linear Regression and Correlation: Introduction, Regression model, Sample Regression equation, Evaluating the regression equation, Using the regression equation, Correlation model, Correlation coefficient, Some Precautions.

Chi-square Test: Introduction, Characteristics, Assumptions for validity, Applications of Chi-Square test: Goodness of fit, Test of Independence, Test of Homogeneity.

TEXT BOOKS:

1. **BIOSTATISTICS-**A Foundation for analysis in the Health Sciences by Warne W Daniel, 7thEdition, John Wiley & Sons Publication.
2. **Fundamentals of Biostatistics** by Khan and Khanum, 2nd Edition, Ukaaz Publications, 2004.

REFERENCE BOOKS:

1. **Principles of Biostatistics** – by Marcello Pagano and KimberleeGauvreu, Thomson Learning Publication, 2006
2. **Introduction to Biostatistics –** by Ronald N Forthofer and EunSul Lee, Academic Press, 1995.
3. **Basic Biostatisitcs and its Applications –** by Animesh K Dutta,New Central Book Agency, 2006.

BIOMEDICAL DSP
10IT6GE2MD (EXCEPT ML)

Objective:

Examining the full scope of digital signal processing in the biomedical field, this course provides the basics of digital signal processing as well as programming in MATLAB for designing and implementing digital filers for biomedical application. It provides a set of laboratory experiments that can be done using either an actual analog-to-digital converter , or taking the available data base to process the biomedical signals. The course emphasizes on feature extraction and classification of normal and abnormal features using different modeling techniques.

UNIT I **[10 hours]**

INTRODUCTION TO BIOMEDICAL SIGNALS:

The nature of biomedical signals, the action potential, objectives of biomedical signal analysis, Difficulties in biomedical signal analysis, computer aided diagnosis. Basic Electrocardiography, ECG data acquisition, ECG lead system, ECG parameters and their estimation, The use of multi-scale analysis for parameter estimation of ECG waveforms, Arrhythmia analysis monitoring, long term continuous ECG recording, Neurological Signal Analysis The brain and its potentials, The electrophysiological origin of brain waves, The EEG signal and its characteristics, EEG analysis.

UNIT II **[09 hours]**

Cardiological Signal Processing:

Adaptive Interference/Noise Cancellation, A review of Wiener filtering problem, Principle of an Adaptive filter, The steepest-descent algorithm, the Widrow-Hoff least mean square adaptive algorithm, Adaptive noise canceller, Cancellation of 60Hz interference in ECG, Canceling Donor-heart interference in Heart-transplant electrocardiography, Cancellation of ECG signal from the electrical activity of the chest muscles, canceling of maternal ECG in fetal ECG, Cancellation of High frequency noise in Electro-surgery.

UNIT III **[06 hours]**

ECG Data Reduction Techniques

Direct data compression techniques, Direct ECG data compression techniques, rmation compression techniques, Transformation compression techniques, other data compression techniques, Data compression techniques comparison.

UNIT IV **[06 hours]**

LINEAR PREDICTION THEORY

The Autoregressive (AR) method, Recursive estimation of AR parameters, Spectral error measure, Adaptive segmentation, Transient detection and elimination- the case of epileptic patients, overall performance. Sleep EEG. Data acquisition and classificationof sleep stages, The Markov model and Markov chains, Dynamics of sleep-wake transitions, Hypnogram model parameters, Event history analysis for modeling sleep.

UNIT V **[08 hours]**

Prony's Method:

Exponential modeling, Exponential parameter estimation, The original Prony problem, Least squares Prony method, The covariance method of linear prediction, Prony's method in the presence of noise, clinical application of Prony's method.

Simulation EXPERIMENTS:

FIR filter Design, iir filter design , implementing Pan Tompkins algorithm, adaptive filters for cancelling different noise in ecg, AR prediction , Time frequency analysis for biomedical signals.

TEXT BOOKS:

1. **"Biomedical Signal Processing Principles and Techniques",** by D C Reddy, The McGraw-Hill publications.
2. **"Biomedical Signal Analysis a case study approaches",** by Rangaraj M. RangayyanThe John Wiley publications

REFERENCE BOOK:

"Biomedical Digital Signal Processing", Willis J. Tompkins, The Prentice Hall of India publications.

MEMS TECHNOLOGY
12IT6GE2MT

UNIT I **[12 hours]**

MEMS: MICRO-FABRICATION, MATERIALS AND ELECTRO- MECHANICAL CONCEPTS

Overview of micro fabrication – Silicon and other material based fabrication processes – Concepts: Conductivity of semiconductors-Crystal planes and orientation-stress and strain-flexural beam bending analysis-torsional deflections-Intrinsic stress- resonant frequency and quality factor.

UNIT II **[08 hours]**

ELECTROSTATIC SENSORS AND ACTUATION

Principle, material, design and fabrication of parallel plate capacitors as electrostatic sensors and actuators-Applications

UNIT III **[10 hours]**

THERMAL SENSING AND ACTUATION

Principle, material, design and fabrication of thermal couples, thermal bimorph sensors, thermal resistor sensors-Applications.

UNIT IV **[10 hours]**

PIEZOELECTRIC SENSING AND ACTUATION

Piezoelectric effect-cantilever piezo electric actuator model-properties of piezoelectric materialsApplications.

UNIT V **[12 hours]**

CASE STUDIES

Piezoresistive sensors, Magnetic actuation, Micro fluidics applications, Medical applications, Optical MEMS, Introduction to NEMS.

REFERENCE BOOKS:

1. Chang Liu, "Foundations of MEMS", Pearson International Edition, 2006.
2. Marc Madou , "Fundamentals of microfabrication",CRC Press, 1997.
3. Boston , "Micromachined Transducers Sourcebook",WCB McGraw Hill, 1998.
4. M.H.Bao "Micromechanical transducers :Pressure sensors, accelerometers and gyroscopes", Elsevier, Newyork, 2000.

B.M.S COLLEGE OF ENGINEERING, BANGALORE-19

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EMBEDDED SYSTEM DESIGN

10EE6GE3ED

Objectives:

- Create an environment for the systematic and effective application of scientific principles to the efficient design and operation of computer-based structures, processes and systems.
- Create a setting where students can identify deficiencies or weaknesses in an existing solution and try novel ideas to improve it.
- Indulge the concept where the task of design is fundamental and central.
- Prepare educational materials that have a great deal of content, while at same time teaching students to think and discover for themselves.
- Further enhancement of this subject for students will be in the field of Robotics, navigation, missile, satellite launching, wireless communication, instrumentation controls and defense applications from which students are benefitted to the greater extent and they will be convinced that this subject plays a vital role for the future scope.

UNIT I **[12 hours]**

Concept of embedded system design: Internal Block Diagram, Components, classification, skills required. Embedded Micro controller cores: Features, Architecture and block diagram of Motorola Controller (6808 or 6811).Embedded Memories ROM variants, RAM, Applications of

embedded system: Examples of Embedded systems, SOC for cellular phones, Smart cards, etc.

UNIT II **[09 hours]**

Technical aspects of Embedded System: Interfacing between analog and digital blocks, Signal conditioning, digital signal processing, DAC & ADC interfacing, various signal conditioning circuits using DSP or Motorola Controller.

UNIT III **[10 hours]**

Interfacing Concepts: Sample & hold, multiplexer interface, Internal ADC interfacing with DSP or Motorola Controller, Data Acquisition System and Signal processing circuits, criteria in the selection of embedded system design, Design challenge, design technology, Software aspects of Embedded Systems.

UNIT IV **[11 hours]**

Software Design: Real time programming Languages, operating systems. Programming concepts and embedded programming in C, Scheduling algorithms such as Round Robin, Round Robin with interrupts, priority, pre-emptive, function queue-scheduling architecture, Real time OS architecture, and selection.

UNIT V **[10 hours]**

Peripheral Interfacing: Introduction to RTOS, Subsystem interfacing with external systems such as, Serial I/O devices, Parallel port interfaces, Input switches, Key boards and Memory interfacing. 10 Hours

TEXT BOOKS:

1 **"Embedded Microcomputer systems:** Real time interfacing"- Valvano, J.W, Brooks/Cole, 2000

2. **"Embedded System, Architecture, Programming and Design"- Raj Kamal TMH 2003.**

REFERENCE BOOKS:

1. **"A Unified Hardware/Software Introduction"**-Frank Vahid/Tony Givargis, Wiley student edition 2002 .

2. Jane W.S., Liu, **"Real time systems",** Pearson Education Asia Pub, 2004**.**

3. Motorola and Intel Manuals

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ELECTRONIC INSTRUMENTATION

10EE6GE3EI (EE ONLY)

Objective

The measuring instruments play an important role for any circuit applications. The various types of electrical/mechanical measurements can be done using voltmeters, recorders, transducers, phase meters etc. The subject gives a detail study of various types of measurements needed and the type of instruments needed for the same. This would be useful to students to enhance their knowledge in this field.

UNIT I **[11 hours]**

Electric instruments for measuring basic parameters: Introduction, amplified DC meter, AC voltmeter using rectifiers, electronic multi meter, considerations in choosing an analog voltmeter, Q meter.

UNIT II **[10 hours]**

Strip Chart Recorders, Galvanometer type, Null type, X-Y

recorders Standard Signal Generator, AF sine and square wave generator, function generator, square and pulse generator .(block diagram description)

UNIT III **[11 hours]**

Transducers: classification of transducers, selecting a transducer, potentiometric transducer, LVDT, strain gauges types, Piezo electric transducers, problems.

UNIT IV **[10 hours]**

Field Strength Meter, Stroboscope Phase meter, Direct reading Impedance meter, LC bridge, R-X meter

UNIT V **[10 hours]**

Instrumentation Systems, interfacing transducers to electronic control and measuring systems, multiplexing.

TEXT BOOKS:

1. **Modern Electronic Instrumentation and Measurement Techniques,** Albert.D.Helfrick, William.D.Cooper, 3/e Pearson, PHI.
2. **Electronic Instrumentation,** H.S. Kalsi, TMH.

REFERENCE BOOK:

A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, 18th Edition, DhanpatRai and Co., New Delhi.

RENEWABLE ENERGY RESOURCES
10EE6GE3RE

UNIT I **[13 hours]**

Introduction to energy sources, need for non-conventional energy sources

SOLAR ENERGY: Introduction, extra terrestrial and terrestrial solar radiation, Solar Constant, Basic Sun-Earth Angles – definitions and their representation, Solar Radiation Geometry (numerical problems), Estimation of Solar Radiation of Horizontal and Tilted Surfaces (numerical problems); Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer.

SOLAR- ELECTRIC CONVERSION SYSTEM: solar energy collection ,thermal energy transfer, thermal energy storage, energy conversion

Solar Thermal Systems: Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Box type, concentrating dish type, Solar driers, Solar Still, Solar Furnaces, Solar Green Houses.

UNIT II **[07 hours]**

Solar Electric Systems: Solar Thermal Electric Power Generation – Solar Pond and Concentrating Solar Collector (parabolic trough, parabolic dish, Central Tower Collector).

Advantages and Disadvantages; Solar Photovoltaic – Solar Cell fundamentals, characteristics, classification, construction of module, panel and array. Photo-voltaic energy storage, Solar PV Systems – stand-alone and grid connected; Applications – Street lighting, Domestic lighting and Solar Water pumping systems. Central receiver systems, the Heliostats, satellite solar power systems.

UNIT III **[09 hours]**

Wind energy: Introduction, principles of wind power, wind turbine operation, site characteristics, variation of power output with wind speed, new developments: small machines, large machines.

UNIT IV **[12 hours]**

Energy from oceans: Introduction, ocean temperature differences, the open or Claude cycle, modification of the open OTEC cycle, the closed or Anderson cycle, OTEC cycle, ocean waves, wave motion, energy and power from waves, wave-energy conversion by floats, high pressure accumulation wave machines, the tides, the simple single-pool tidal system, the modified single-pool tidal system, the two-pool tidal system biofouling, Advantages &Limitation of OTEC**. GEOTHERMAL ENERGY:** Introduction, origin and types of geothermal energy, operational and environmental problems, vapor dominated systems, liquid dominated systems, (flashed steam, binary cycle, total flow concept)

UNIT V **[11 hours]**

Energy storage: Energy storage systems, pumped hydro, compressed air storage, energy storage by (i) flywheels (ii) electrical battery (iii) super conducting magnet, (iv) latent heat (v)chemical reaction (vi) thermal sensing.

Emerging Technologies: Fuel Cell, Small Hydro Resources, Magneto Hydro Dynamic Generation, Hydrogen Energy, (Principle of Energy generation using block diagrams, advantages and limitations).

TEXT BOOK:

"Non-Conventional Sources of Energy"- 4th Edition, G.D.Rai, Khanna Publishers, New Delhi, 2007

REFERENCE BOOKS:

1. "Generation of electrical Energy"-B.R.Gupta-S.Chand& Company Ltd
2. "Non-Conventional Energy Resources"- Khan, B. H., TMH, New Delhi, 2006.

REAL TIME EMBEDDED SYSTEMS
10TC6GE3RT

Objective

- ability to apply knowledge of simple Mathematics like probability and Science in Telecommunication Engineering
- ability to analyze computer controlled system operations & its application in a field Electronics and Communication (embedded system)
- ability to identify the real time application and analyze its benefits in Electronics Engineering
- recognize the need for real time systems in communication engineering and pursue life-long learning in it

UNIT I [10 hours]

INTRODUCTION TO REAL-TIME SYSTEMS: Definition of Real Embedded Systems, RTS Definition, Classification of Real-time Systems, Time constraints, applications, basic model, Characteristics, Classification of Real-time Systems, safety and reliability. modeling time constraints.

UNIT II [11 hours]

REAL TIME OPERATING SYSTEM CONCEPTS- features of RTOS, architecture of the kernel, tasks and task scheduler, task states, context switching, classification of task scheduling algorithm, clock driven scheduling, hybrid scheduler, event driven scheduling, Earliest Deadline First (EDF) scheduling, Rate Monotonic Algorithm(RMA)

UNIT III **[11 hours]**

HANDLING RESOURCE SHARING AND DEPENDENCIES AMONG REAL TIME TASKS: resource sharing among real time tasks, assigning priorities, Priority Structures, priority inversion, critical region, semaphores, shared data , signals, message queues,mailboxes , pipes, timers, memory management

UNIT IV **[10 hours]**

REAL TIME COMMUNICATION: I/O devices, timer & counting devices; watchdog timer, real time clock, serial communication protocols- I2C, CAN, USB buses, IEEE 1394 - Firewire; parallel communication protocols-ISA, PCI and PCI/X buses, ARM bus.

UNIT V **[10 hours]**

SURVEY OF COMMERCIAL RTOS AND CASE STUDIES: Windows asRTOS(Windows CE), RTLinex, POSIX, VXworks, MicroC/OS II, case study of digital camera hardware and software architecture, case study of an embedded system for a smart card, embedded system for automobile

TEXT BOOK:

1. **Embedded Systems Architecture; Programming and Design -** Rajkamal;second edition, Tata McGraw Hill Publications.
2. **Real-time computer control – An Introduction –** Stuart Bennet, 2nd Edn. Pearson Education. 2005
3. **Embedded /real time Systems: concept, design & programming -** DR K.V.K.K. Prasad-dream tech press

REFERENCE BOOKS:

1. **An Embedded software primer-**David E Simon; Addison Wesley; 2000
2. **Real–Time Systems Design and Analysis––**3rd Edition, Phillip A. Laplante. Apr 2004. Wiley-IEEE Press.
3. **An Introduction to Real Time Systems-**Raymond J.A. Buhr; Donald L. Bailey; Prentice Hall International; 1999.
4. **"A Unified Hardware/Software Introduction"**-Frank Vahid/Tony Givargis, Wiley student edition 2002 .

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AUTOMOTIVE EMBEDDED SYSTEM DEVELOPMENT TECHNOLOGY
12ES6GE3AE

UNIT I:

Automotive Architecture: Need for Electronics in Automotives, Introduction to ECUs, Vehicle Functional Domains and their requirements- General Context , Functional Domains, Standardized Components, Models, and Processes , Intelligent Vehicle Technologies- Road Transport and its Evolution, New Technologies, Dependability Issues, Fully Autonomous Car. **12 Hours**

UNIT II:

Automotive Communication Systems: Characteristics and constraints, In-car embedded networks: CAN, FlexCAN, TTCAN, Flexray, LIN, MOST and IDB1394 protocols, Car-to-Car (C2C) and Car-to-Infrastructure (C2I) communications **10 Hours**

UNIT III:

Model Based Development (MBD) of Automotive Embedded Systems: Overview, Motivations for MBD of Automotive Embedded Systems, Context, concern and requirements, MBD Technology, State of the art and practice, Guidelines for adopting MBD in Industry . **10 Hours**

UNIT IV:

Product Lines in Automotives: Basic concepts of software product lines, Characteristics and needs of automotive electronics with respect to product line Engineering, Variability, Feature modeling as a form of variability modeling, Feature modeling for the automotive product line, Global coordination of small, medium and complex product line variability. **12 Hours**

UNIT V:

Standardization in Automotive ECU Development: Traditional approach and its shortcomings, Worldwide standards, AUTOSAR based automotive ECU development, AUTOSAR architecture, AUTOSAR methodology, AUTOSAR in practice, Conformance testing, Migration to AUTOSAR, AUTOSAR in OEM-supplier collaboration. **10 Hours**

Text Book:

1. "Automotive Embedded Systems Handbook", Nicolas Navet, Industrial Information Technology Series, CRC press.

Reference Books:

1. "Automotive Electrics Automotive Electronics", 5th edition, Robert Bosch GmbH, Wiley publications.
2. "Automotive Electronics Handbook", Ronald K Jurgen, McGraw-Hill, Inc, 2nd edition.

FUNDAMENTALS OF IMAGE PROCESSING
12ES6GE3IP

UNIT I [07 hours]

Introduction to Image Processing: Introduction, Fundamental steps in DIP, Components of DIP system, A simple image formation model, Image sampling and quantization, Basic relationship between pixels, Arithmetic and Logical operations on images, Image file formats

UNIT II [08 hours]

Image Enhancement in Spatial Domain: Background, Point processing – Image negatives, Log transformations, Power law transformations, Contrast stretching, Gray level slicing, Bit plane slicing, Histogram processing – Histogram equalization, Local enhancement, Smoothening filters, sharpening filters.

UNIT III **[08 hours]**

Image Enhancement in Frequency Domain: Background, Basic properties of the frequency domain, Basic filtering in the frequency domain, Basic filters and their properties, Smoothing frequency domain filters – Ideal lowpass filters, Butterworth lowpass filters, Gaussian lowpass filters, Sharpening frequency domain filters – Ideal highpass filters, Butterworth highpass filters, Gaussian highpass filters, Frequency domain filters, Homomorphic filtering.

UNIT IV **[08 hours]**

Image Restoration: Image degradation/restoration model, Inverse filter, Pseudo Inverse filter, Noise models, Restoration using spatial filtering – Mean filters, Geometric mean filters, Harmonic mean filters, Median filter, Max & min filters, Midpoint filter, Wiener filter, Constrained Least squares filter.

UNIT V **[08 hours]**

Color Image Processing: Fundamentals of color image processing, Color models, Conversion of color models from one form to other form, Pseudo color image processing, Full color image processing, Color Image Quantization, Histogram of color Image.

Basic Image Transforms: Two-dimensional orthogonal unitary transforms, Properties of Unitary Transforms, K-L Transform.

Lab Experiments to be conducted using MATLAB:

1. Negative of an image
2. Arithmetic and Logical Operations on an image
3. Average of an image, Zooming and Pixel replication of an image
4. Bit – plane slicing of an image
5. Power – law transformation and Logarithmic transformation of an image
6. Histogram equalization and Contrast enhancement of an image
7. Basic transformation of an image
8. Gray level slicing of an image (With and Without Background Preservation)
9. Butterworth Low Pass and High Pass filters

10. Gaussian Low Pass and High Pass filters.
11. Inverse Filter and Pseudo Inverse filter.
12. Wiener filter.
13. Color Median filter
14. Color histogram equalization
15. Pseudo – color image processing

TEXT BOOK:

Digital Image Processing by Rafael C. Gonzalez & Richard E. Woods, Third Edition, Pearson education, 2009.

REFERENCE BOOKS:

Digital Image Processing by S.Jayaraman, S.Esakkirajan, T.Veerakumar, TMH, 2009.

DESIGN OF ANALOG & MIXED MODE VLSI CIRCUITS

10TC6GE3MM *(Only TC)*

Objective:

This course deals with the analysis and design of analog CMOS integrated circuits, emphasizing fundamentals as well as new paradigms. The objective is to develop both a solid foundation and methods of analyzing circuits by inspection so that the student learns what approximations can be made in which circuits and how much error to expect in each approximation.

UNIT I **[10 hours]**

Introduction to CMOS analog circuits

Basic MOS Device Physics: General considerations, MOS I/V Characteristics, second order effects, MOS device models.

UNIT II **[10 hours]**

Single stage Amplifier: CS stage with resistance load, divide connected load, current source load, triode load, CS stage with source degeneration, source follower, common-gate stage, cascade stage, choice of device models.

Differential Amplifiers: Basic difference pair, common mode response, Differential pair with MOS loads, Gilbert cell.

UNIT III **[10 hours]**

Operational Amplifiers: One Stage OP-Amp. Two Stage OP-Amp, Gain boosting, Common Mode Feedback, Slew rate, PSRR. Compensation of 2stage OP-Amp, Other compensation techniques

UNIT IV **[10 hours]**

Data converter fundamentals: Analog versus Digital Discrete Time Signals, Converting Analog Signals to Data Signals, Sample and Hold Characteristics, DAC Specifications, ADC Specifications, Mixed-Signal Layout Issues.

UNIT V **[12 hours]**

Data Converters Architectures: DAC Architectures, Digital Input Code, Resistors String, R-2R Ladder Networks, ADC Architectures, Flash, 2-Step Flash ADC, Pipeline ADC, Integrating ADC, Successive Approximation ADC.

TEXT BOOKS:

1. **Design of Analog CMOS Integrated Circuits,** B Razavi, First Edition, McGraw Hill,2001
2. **Design, Layout, Stimulation ,**R. Jacob Baker, Harry W Li, David E Boyce, CMOS Circuit, PHI Education, 2005

REFERENCE BOOKS:

CMOS Analog circuit Design Phillip. E. Allen, Douglas R. Holberg, Oxford University Press, 2002

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BIOMEDICAL CIRCUITS WITH VLSI

12ML6GE3BC

Objective: This s u b j e c t gives an overview of VLSI i.e. basic concepts of physical structure of CMOS integrated circuits and various layers of MOSFET. The working principle and implementation of basic gates, switches, Boolean operations and transmission gates is studied. The DC characteristics and transient response of logic gates will be explored.

Outcome: The student will be capable of exploring the applications of CMOS circuits in biomedical implantable devices and wireless integrated Neuro-chemical and Neuro-potential sensing. Like, self-powered sensors, solid state interface fabrication methods for Hollow out of plane microneedles. CMOS circuits for wireless medical applications: like spectrum regulations integrated receiver & transmitter architecture can be undertaken.

UNIT I **[09 hours]**

An Overview of VLSI: Complexity and design. Basic concepts, Physical structure of CMOS integrated circuits: Integrated circuit layers, MOSFETS.

UNIT II **[10 hours]**

Ideal switches and Boolean operation, MOSFETS and switches, Basic logic gates in CMOS, Complex logic gates in CMOS, Transmission gate circuits, CMOS layers, Designing FET array.

UNIT III **[10 hours]**

Electronic analysis of CMOS Logic gates, DC characteristics of the CMOS Inverter, Inverter Switching characteristics, Power dissipation, DC characteristics of NAND and NOR gates, NAND and NOR transient response, Analysis of complex logic gates, Gate design for transient performance.

UNIT IV **[9 hours]**

Fabrication of CMOS integrated circuits, Overview of silicon processing, material growth and deposition, lithography, CMOS process flow

UNIT V **[14 hours]**

CMOS Circuits for Biomedical Implantable Devices: Introduction, Inductive Link to Deliver Power to Implants, High Data rate Transmission Through Inductive links, Energy and Bandwidth Issues in Multi –Channel Biopotential Recordings. Self-Powered Sensors and circuits for biomechanical Implants: Introduction, Fundamentals of Piezoelectric Transduction and power Delivery. CMOS Circuits for Wireless Medical Applications: Introduction, Spectrum Regulations for Medical use, Integrated Receiver Architecture, Integrated Transmitter Architecture, Radio Architecture selection, System Budget calculations, Low noise Amplifier, Mixers, Polyphase Filter, Power Amplifier, PLL.

TEXT BOOKS:

1. JOHN P. UYEMURA, John Wiley , **"Introduction to VLSI circuits andsystems",** Wiley 2001 edition. For Unit:1, 2,3.
2. Krzysztof Iniewski " **VLSI circuits for Biomedical Applications"** Artech House 2008 edition. For Unit 4 and 5.

REFERENCE BOOK:

Douglas A. Pucknell and Kamran Eshranghian, **"Basic VLSI Design",** PHI third edition, 2005.

Question Paper Pattern: Internal Choice in Unit 4 and Unit 5

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REHABILITATION ENGINEERING

10ML6GE3RE

Objective:

To describe the role of occupational/physical/speech therapy, rehabilitation psychology and the multidisciplinary rehabilitation team in treating disabled patients in acute and chronic care settings. To comprehend rehabilitation framework of disease, functional impairment, activity limitation and barriers to social participation in approaching neurologic problems.

UNIT I **[12 hours]**

Introduction to Rehabilitation & Rehabilitation Team: What is Rehabilitation, Epidemiology of Rehabilitation, Health, Levels of Prevention, Preventive Rehabilitation, Diagnosis of Disability, Functional Diagnosis, Importance of Psychiatry in Functional diagnosis, Impairment disability handicap, Primary & secondary Disabilities, Effects of prolonged inactivity & Bed rest on body system**.**

Rehabilitation Team: Classification of members, The Role of Physiatrist, Occupational therapist, Physical therapist, Recreation therapist, Prosthetist-Orthotist, Speech pathologist, Rehabilitation nurse, Social worker, Corrective therapist, Psychologist, Music therapist, Dance therapist & Biomedical engineer.

UNIT II **[10 hours]**

Therapeutic Exercise Technique

Co-ordination exercises, Frenkels exercises, Gait analyses-Pathological Gaits, Gait Training, Relaxation exercises-Methods for training Relaxation, Strengthening exercises-Strength training, Types of Contraction, Mobilisation exercises, Endurance exercises.

UNIT III **[10 hours]**

Principles in Management of Communication

Impairment-introduction to communication, Aphasia, Types of aphasia, Treatment of aphasic patient, Augmentative communication-general form of communication, types of visual aids, Hearing aids, Types of conventional hearing aid, Writing aids.

UNIT IV **[10 hours]**

Orthotic Devices in Rehabilitation Engineering

General orthotics, Classification of orthotics-functional & regional, General principles of Orthosis, Biomechanics of orthoses, merits & demerits of orthotics, Material design consideration in orthotics, Calipers-FO, AFO, KAFO, HKAFO. Spinal Orthosis, Cervical, Head cervical thoracic orthosis, Thoraco lumbar sacral orthosis, Lumbosacroorthosis, Splints-its functions & types.

UNIT V **[10 hours]**

Prosthetic Devices

Introduction, Partial Foot Prostheses- Foot-ankle assembly, Trans femoral Prostheses – Knee unit, Axis system, Friction Mechanisms, Extension aid, Stabilizers, Socket. Disarticulation Prostheses-Knee Disarticulation Prostheses, Hip Disarticulation Prostheses.

TEXT BOOK:

Rehabilitation Medicine By Dr. S. Sunder (Jaypee medical publications, New Delhi) Physical Rehabilitation by Susan B O'Sullivan, Thomas J Schmitz. 5th edition

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ROBOTICS

10IT6GE3RB

UNIT I **[07 hours]**

Introduction

Objectives, Classification of robots, Major components of robot, definitions: Kinematics, Controls, and actuators. Robot history, types and applications current and future with examples. Fixed and flexible automation

UNIT II **[10 hours]**

Robot Arm Kinematics

Introduction, The direct kinematics problem, Rotation Matrices, Composite rotation Matrix, Rotation matrix about arbitrary axis, Rotation matrix with Euler angle representation, Geometric interpretation of rotation matrix, Homogenous coordinates and transformation matrix, Geometric interpretation of Homogenous transformation matrices, Composite homogenous transformation matrices, Links, Joints, and their parameters, The Denavit - Hartenberg representation, Kinematic equation for manipulator, Other specifications of the locations of the end effectors, Inverse kinematics problem.

UNIT III **[08 hours]**

Control of Actuators

Objective, Motivation, Closed loop control in position servo, Effect of friction and gravity, Adaptive control, Optimal control, Computed torque technique, Transfer function of single joint, Position control for single joint, Brief discussion on performance and stability criteria.

UNIT IV **[10 hours]**

Sensors

Sensor characteristics, Position sensors- potentiometers, Encoders, LVDT, Resolvers, Displacement sensor, Velocity sensor- encoders, tachometers, Acceleration sensors, Force and Pressure sensors – piezoelectric, force sensing resistor, Torque sensors, Touch and tactile sensor, Proximity sensors-magnetic, optical, ultrasonic, inductive, capacitive, eddy-current proximity sensors.

Hall Effect sensors, Binary sensors, Analog sensors, Force and Torque sensing, Elements of a Wrist sensor.

UNIT V **[10 hours]**

Vision and Processing :

Image acquisition, illumination Techniques, imaging geometry, some basic transformations, perspective transformations.

Camera model, camera calibration, stereo imaging, Higher-Level Vision: Segmentation, Edge Linking and Boundary detection, Thresholding. Region-oriented segmentation, Use of motion, Description, Boundary descriptors, Regional descriptors.

Mini project: **[7 Hours]**

Discussion on DC motors with gears, Stepper motor, Servo motor ,Mini projects using Basic sensors, 555 timers, Motors (DC motors with gears, Stepper motor, Servo motor)

A batch of TWO students are required to undertake a mini project to showcase the knowledge acquired during the course of this study.

Example topics :

1. Line follower robot
2. Obstacle avoiding robot
3. Face reorganization algorithm
4. MATLAB simulation or Use of robo sim
5. PCB design workshop (Using PCB design software)

Note: Carrying out small models / prototypes of projects are mandated which will carry a 20 percent weight in CIE

Project report has to be submitted with following chapters followed by a presentation

1. Abstract
2. Introduction
3. Block diagram
4. Materials used with detailed specification
5. Design and Design issues in detail
6. Model testing

TEXT BOOKS:

1. "Robotics – control, sensing, Vision and Intelligence", K.S.Fu, R.C.Gonzalez, C.S.G. Lee, McGraw Hill, 1987.

2. "Robotic Engineering" - Richard D Klafter, PHI

REFERENCE BOOKS:

1. "Introduction to Robotics Mechanics and control", John J. Craig, 2nd Edition, Pearson education, 2003

OPTICAL INSTRUMENTATION
12IT6GE3OI

Objectives:

This course will provide the student with a fundamental understanding of optical system design and instrumentation. The course begins with the foundations of geometrical optics, which includes the first-order properties of systems, and paraxial ray tracing, continues with a discussion of elementary optical systems, and concludes with an introduction to optical materials and dispersion. A special emphasis is placed upon the practical aspects of the design of optical systems.

Outcomes:

Upon the completion of this course student should be able to:

Describe the properties, characteristics and applications of lasers

Describe scientific and engineering applications of laser such as Doppler velocimeter, holography etc.

Understand the impo1tance of integrated optics and its applications of fiber optical sensors.

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UNIT I **[12 hours]**

LASER TYPES AND CHARACTERISTICS : Principles, classification, construction of Ruby, He-Ne, Nd-YAG, semiconductor, Argon and Carbon dioxide lasers. Characteristics of stabilization, Q-switching and mode locking, frequency stabilization, line shape function, lasing threshold, application of lasers in engineering and medicine, safety with lasers.

UNIT II **[10 hours]**

LASER INSTRUMENTS: laser interferometry, laser strain gauges, velocimetry, pulse echo technique, beam modulation telemetry and holography, application of holography, laser welding, laser machining and laser spectroscopy

UNIT III **[08 hours]**

OPTOELECTRONIC DEVICES AND COMPONENTS: Photo diodes, PIN diodes, solar cells, LED's phototransistors, opto-isolators, photocouplers.

UNIT IV **[12 hours]**

FIBER OPTICS: light Modulation schemes, optical fibers, intermodal dispersion, graded index fiber, low dispersive fibers Fiber losses, fiber materials, integrated optics, optical bistability, laser printing, optical multiplexers

UNIT V **[10 hours]**

OPTICAL FIBER SENSORS: Multimode passive and active fiber sensors, phasemodulated sensors, fiber optic gyroscope, Polarization: polarimetric sensors, polarization, and rotation sensors

TEXT BOOK:

1. "Optoelectronics", Wilson & Hawkes, Prentice Hall of India.
2. "Laser principles and applications", Wilson and Hawkes, Prentice Hall of India

REFERENCE BOOKS:

1. "Essentials of Opto Electronics with Applications", A.J. Rogers, CRC Press.
2. "Principles of Optical Communication & Opto Electronics", L Ravikumar, Bala N.Saraswathi, Lakshmi Publications.

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POWER SYSTEM OPERATION AND CONTROL

11EE7GE4PS

UNIT I **[12 hours]**

Power system Control And operating states, digital computer configuration, automatic generation control, area control error, Automatic load frequency control, Automatic load frequency control of single area systems, Speed governing systems Hydraulic valve actuator, Turbine generator response, Static performance of speed governor, Closing of ALFC loop, Concept of Control Area, Static response of primary ALFC loop.

UNIT II **[10 hours]**

ALFC of multi-area systems (POOL operation), the two-area system, modeling of the tie-line, Block diagram representation of Two-Area Systems, Static response of two area system and Tie line Bias Control, Automatic Voltage regulator: Basic generator control loops, Cross-coupling between control loops, Exciter types, Exciter modeling, Generator modeling, Static performance of AVR loop

UNIT III **[10 hours]**

Control of voltage and reactive power: Introduction, Generation and Absorption of reactive power, Relation between voltage, power and reactive power at a node, single machine infinite bus systems, methods of voltage control, sub synchronous resonance, voltage stability, voltage collapse, Overview of Economic Operation of Power systems without losses.

UNIT IV **[10 hours]**

Unit Commitment: Statement of the unit commitment problem, need and importance of unit commitment, Constraints in unit commitment, Unit commitment solution methods-Priority lists method, Forward Dynamic Programming method, Spinning reserve.

Power system security: Introduction, factors affecting power system security, an overview of security analysis, linear sensitivity factors, AC power flow methods, contingency evaluation, techniques for contingency evaluation

UNIT V **[05 hours]**

System monitoring and control: Introduction, Energy Management systems, the basis of power system state estimation (PSSE), mathematical description of PSSE process, minimization technique for PSSE, Least square estimation, Error and detection in PSSE, System security and emergency control.

TEXT BOOKS:

1. **Modern Power System Analysis**- I J Nagarath and D P Kothari, T M H , 3 r d Edition, 2003
2. **Electrical Energy Systems Theory,** O.J Elgerd, TMH,2008.
3. **Power generation, operation and control**- Allen J Wood & Woollenberg. John Wiley and Sons, Second Edition, 2009.
4. **Electric Power Systems-** B.M.Weedy and B.J. Cory, Wiley student edition, 1999
5. **Computer Aided Power System Operation and Analysis-** R.N. Dhar, Tata McGraw-Hill, 1987.

REFERENCE BOOKS:

1. **Computer Aided Power System Analysis-** G.L.Kusic, PHI,2010.
2. **Power System Analysis, Operation and Control,** Abhijit Chakrabarti and Sunita Halder, PHI, Second Edition, 2009

INDUSTRIAL DRIVES &APPLICATIONS
11EE7GE4ID

Objective

With the increase in the demand for power electronics devices, the use of power electronics, in drive circuits have increased. DC & AC motors can be controlled using highly compact power electronics circuits. This subject is versatile and can be useful to all students of the electrical cluster stream.

UNIT I [08 hours]

AN INTRODUCTION TO ELECTRICAL DRIVES & ITS DYNAMICS: Electrical drives. Advantages of electrical drives, Parts of electrical drives, choice of electrical drives, status of dc and ac drives, Dynamics of electrical drives, Fundamental torque equation, speed torque conventions and multiquadrant operation. Equivalent values of drive parameters, components of low torques, nature and classification of load torques, calculation of time and energy loss in transient operations, steady state stability, load equalization.

UNIT II **[10 hours]**

SELECTION OF MOTOR POWER RATING: Thermal model of motor for heating and cooling, Classes of motor duty, determination of motor rating.

INDUSTRIAL DRIVES: Rolling mill drives, cement mill drives, paper mill dries and textile mill drives.

UNIT III **[12 hours]**

D C MOTOR DRIVES:

(a) Starting braking, transient analysis, single phase fully controlled rectifier, control of dc separately excited motor, Single-phase half controlled rectifier control of dc separately excited motor.

(b) Three phase fully controlled rectifier control of dc separately excited motor, three phase half controlled controlled rectifier control of dc separately excited motor, multiquadrant operation of dc separately excited motor fed form fully controlled rectifier. Rectifier control of dc series motor, chopper controlled dc drives, chopper chopper control of separately excited dc motor. Chopper control of series motor.

UNIT IV **[12 hours]**

INDUCTION MOTOR DRIVES:

(a) Operation with unbalanced source voltage and single phasing, operation with unbalanced rotor impedances, analysis of induction motor fed from non-sinusoidal voltage supply, starting braking, transient analysis.

(b) Stator voltage control variable voltage frequency control from voltage sources , voltage source inverter control, closed loop control, current source inverter control, current regulated voltage source inverter control, rotor resistance control, slip power recovery, speed control of single phase induction motors.

UNIT V **[10 hours]**

SYNCHRONOUS MOTOR DRIVES: Operation form faced frequency supply, synchronous motor variable speed drives, and variable frequency control of multiple synchronous motors. Self-controlled synchronous motor drive employing load commutated thruster inverter.

TEXT BOOK:

Fundamentals of Electrical Drives, G.K Dubey , Narosa publishing house, 2nd Edition,2002.

REFERENCE BOOKS:

1. Electrical Drives, N.K De and P.K. Sen- PHI, 2009.
2. A First Course On Electric Drives, S.K Pillai-Wiley Eastern Ltd 1990.

LOW POWER MICROCONTROLLER

12TC7GE4MC *(EXCEPT ML)*

Objectives

- Ability to design, build, and debug simple microcontroller based systems by applying the knowledge of Mathematics and Engineering
- Ability to use a development environment that includes simulators, debuggers, cross compilers etc in the development of low power applications.
- Ability to identify, formulate and develop assembly and C code for mixed signal applications .
- Ability to work in a team and thereby learn how to cooperate in teams

UNIT I **[08 hours]**

Introduction - Motivation for MSP430microcontrollers – Low Power embedded systems Main characteristics of a MSP430 microcontroller, Main features of the MSP430X RISC CPU architecture, Address space, Interrupt vector table, Flash/ROM, Information memory (Flash devices only), Boot memory (Flash devices only), RAM, Peripheral Modules, Special Function Registers (SFRs), Central Processing Unit (MSP430 CPU), Arithmetic Logic Unit (ALU), MSP430 CPU registers, Central Processing Unit (MSP430X CPU), MSP430X CPU registers.

UNIT II **[08 hours]**

Addressing modes & Instruction set- Double operand instructions, Single operand instructions, Program flow control – Jumps, Emulated instructions and programming.

UNIT III **[08 hours]**

Device Systems and Operating Modes- system reset, system clock, interrupt management, WDT, WDT+, Basic Timer, Capture/Compare blocks, Timer_A Interrupts, Timer_B special features, Real Time Clock (RTC). Low power operating modes.

UNIT IV **[08 hours]**

On-Chip Peripherals and General Purpose I/O- Hardware multiplier, ADC, DAC, SD16, LCD, DMA, Registers, Interruptible ports, Flashing LED, Blinking the LED, toggle the LED state by pressing the push button, Enable / disable LED blinking by push button.

UNIT V **[07 hours]**

Communications: Communications system model, Transmission mode, Synchronous and asynchronous serial communications, Serial Peripheral Interface (SPI) communication protocol, MSP430 communications interfaces, Case Studies of applications of MSP430

Lab Experiments

Basic debug introduction using CCE, eZ430-RF2500 Flashing LED, Memory clock with Basic Timer 1, Real Time Clock with Basic Timer 1, LCD message Display , Sample Temperature using SAR ADC10, Temperature data logger using ADC10 , Data acquisition using ADC12

MSP430-EXP430FG4618 Flashing LED, Voltage ramp generator, Data Memory transfer triggered by software , Multiplication without hardware multiplier, Flash memory programming with the CPU executing the code from flash memory.

REFERENCE BOOKS:

1. John H Davies, MSP430 Microcontroller Basics, Newnes Publications, 2008
2. Teaching MSP430, CD provided by Texas Instruments
3. Chris Nagy, Embedded systems Design using TI MSP430 Series, Newnes Publications, 2003

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SOFTWARE DEFINED RADIO

11TC7GE4SR (Only EC, TC)

Objective:

This subject knowledge is helpful because in today's radio communication system where components that have been typically implemented in hardware such as mixers, filters, amplifiers, modulators/demodulators, detectors, etc. are instead implemented by means of software on a personal computer or embedded computing devices.

UNIT I **[10 hours]**

Introduction

Software Based Radio, A Multi-Dimensional Model Sets the Stage, What is Software Based Radio , Software Defined Radio and Software Radio , Adaptive Intelligent Software Radio and Other Definitions , Functionality, Capability and SBR Evolution , Architectural Perspectives for a Software Based Radio , The Radio Implementer plane , The Network Operator plane, Software Radio Concepts , Adoption Timeframes for Software Based Radio, Realization of Software Based Radio Requires New Technology , Power/Performance/Price Limitations of Handsets Dictates Inflexible Networks, Regulatory Concepts Facilitate SBR Introduction

UNIT II **[12 hours]**

Radio Frequency Translation for Software Defined Radio

Requirements and Specifications , Transmitter Specifications , Receiver Specifications, Operating Frequency Bands ,Receiver Design Considerations , Basic Considerations , Receiver Architectures , Dynamic Range Issues and Calculation , Adjacent Channel Power Ratio (ACPR) and Noise Power Ratio (NPR), Receiver Signal Budget , Image Rejection , Filter Functions within the Receiver , Transmitter Design Considerations , Filtering Analogies between Receiver and Transmitter ,Transmitter Architectures, Transmitter Efficiency and Linearity ,Candidate Architectures for SDR , Zero IF Receivers, Quadrature Local Oscillator, Variable Preselect Filters , Low IF Receivers

Unit IV **[10 hours]**

Radio Frequency Front End Implementations for Multimode SDRs Evolution of Radio Systems , Evolution of RF Front Ends – Superheterodyne Architecture , The AN2/6

Product Family – Dual Band, Six Mode , The AN2/6 Architecture , Lessons Learned From the AN2/6 , Alternative RF Front End Architectures , Direct Conversion RF Front Ends , Pure Digital RF Front Ends , Analog Digital Combination Solutions , Directions for a Completely Successful SDR RF Front End

UNIT IV **[10 hours]**

Data Conversion in Software Defined Radios

The Importance of Data Converters in Software Defined Radios , ADCs for SDR Base Stations , ADCs for SDR Handsets , DACs for SDR Applications , Converter Architectures ,Flash Converters , Multistage Converters , Sigma-Delta Converters , Digital-to-Analog Converters , Converter Performance Impact on SDR , Noise Sources – Impact on SDR Sensitivity , SNR of Data Converter , Spurious Impact on Performance , Digital-to-Analog Converter Specification

UNIT V **[10 hours]**

The Digital Front End: Bridge Between RF and Baseband Processing

The Front End of a Digital Transceiver, Signal Characteristics , Implementation Issues , The Digital Front End , Functionalities of the Digital Front End , The Digital Front End in Mobile Terminals and Base Stations , Digital Up- and Down-Conversion , Initial Thoughts , Theoretical Aspects , Implementation Aspects , The CORDIC Algorithm , Digital Down-Conversion with the CORDIC Algorithm , Digital Down-Conversion by Subsampling , Channel Filtering , Low-Pass Filtering after Digital Down-Conversion , Band-Pass Filtering before Digital Down-Conversion, Filterbank Channelizers , Sample Rate Conversion , Resampling after Reconstruction , Rational Factor SRC , Integer Factor SRC ,Concepts for SRC ,Systems for SRC ,Example ,Design Parameters ,Digital Down-Conversion ,Sample Rate Conversion , Channel Filtering

Mini Project:

At the end of the course students are expected to submit a miniproject on SDR implementation using Matlab /C/ LabVIEW /FPGA/DSP Processor/ARM Processor

TEXT BOOK:

Software Defined Radio: Dr Walter Tuttlebee, Wiley

REFERENCE BOOKS:

1. **Bruce Fett, 'Congitive Radio Technology', Newnes**
2. **'Huseyin Arslan, 'Congitive radio, software defined radio and adaptive wireless systems', Springer**

MULTIMEDIA COMMUNICATION
12ES7GE4MC

Objective:

Ability to analyze the classifications and applications of Multimedia and identify various communication modes and media types used in Multimedia.
Ability to analyze various communication networks such as LANs, Ethernet, Token ring and Bridges.
Ability to analyze various text representations used in Multimedia and design various text compression techniques.
Ability to identify various image models used in Multimedia and design various image compression techniques such as GIF, TIFF and JPEG.
Ability to analyze various audio processing methods such as synthesized audio and MIDI and video compression techniques such as MPEG and H.261.
Ability to apply technical knowledge and use engineering tools necessary for engineering practice.
Impart education to develop Engineering solutions with an awareness of industry concerns through implementation of a project.

UNIT I [7 hours]

Fundamentals of Multimedia Communication: Introduction, multimedia information representation, multimedia networks: telephone networks, data networks, broadcast television networks, ISDNs, broadband multiservice networks, multimedia applications: interpersonal communications, interactive applications over internet, entertainment applications.

UNIT II [8 hours]

Multimedia Information Representation: Media types, communication modes, network types, multipoint conferencing: centralized, decentralized and hybrid modes, network QoS, basic digital principles for multimedia.

Multimedia Networks: Introduction to networks in multimedia domain, Local Area Networks, concept of Ethernet, Token ring.

UNIT III **[8 hours]**

Text Representation and Compression: Text representation, Unformatted text, Formatted text, Hypertext, Introduction to compression techniques in multimedia, Text compression principles, Entropy encoding, Source encoding, Transform encoding, Text compression principles: Static Huffman coding ,Arithmetic coding, Basics of LZW coding, Brief overview of other text compression standards.

UNIT IV **[8 hours]**

Image Representation and Compression: Image representation, Graphics, Digitized documents, Digitized Pictures, Raster scan principles, Three color image capture methods, Image compression principles, Image compression techniques: Graphics Interchange Format, JPEG: Image Preparation, Block Preparation, DCT, Quantization, Entropy encoding, Frame builder, Basics of JPEG decoder, Introduction to TIFF and JPEG 2000.

UNIT V **[08 hours]**

Audio Compression: Introduction to audio compression, PCM Speech, CD quality audio, Synthesized audio, MIDI, Brief overview of various audio compression standards.

Video Compression: Introduction to Video compression: Broadcast TV, Color signals, Luminance and Chrominance, Signal bandwidth, digital video: 4:2:2 format, 4:2:0 format, HDTV format, Video compression techniques: Introduction to MPEG and Brief overview of other MPEG standards.

MINI PROJECT:

Mini project would be preceded by lab sessions that would include discussion of prerequisites to undertake the project. The 2 lab sessions would include experiments based on image processing / speech processing using tools such as MATLAB / LABVIEW.

A batch of THREE students is required to undertake a mini project to showcase the knowledge acquired during the course of this study. The project may be pursued with respect to the following sub – domains:

1. Image processing techniques such as enhancement, restoration, segmentation etc.
2. Image compression techniques such as JPEG, JPEG 2000, TIFF etc.
3. Text processing techniques like Huffman coding etc.
4. Text Compression techniques such as LZW coding, ZIP, RAR etc.
5. Audio / Speech compression techniques.
6. Video processing / compression techniques such as MPEG etc.

Implementation of the project including the project report would carry 50% (i.e. 25 out of 50) of the CIE marks.

Project Report has to be submitted with the following chapters followed by demonstration:

1. Abstract
2. Contents
3. Introduction
4. Description of the Project
5. Source Code of the Project
6. Results (Simulation / Snapshots)
7. Conclusion and Future Enhancements
8. Bibliography.

TEXT BOOK:

Multimedia Communications: Applications, Networks, Protocols, and Standards – Fred Halsall, Pearson Education, Second Indian reprint 2002.

REFERENCE BOOK:

Data Compression: The Complete Reference – David Salomon, Springer, Fourth Edition, 2007.

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BIOMETRICS

12ML7GE4BM

Course Objectives

In this course, students will learn methods of biometrics, devices of biometrics, there use for computer security and design and build a secure system. Three academic fields of concentration are taught in this course as related to biometrics: image processing, pattern recognition, and security and privacy.

Course Outcome

Successful completion of this course will prepare the student to Perform R&D on biometrics methods and systems. Evaluate and design security systems incorporating biometrics Understand the technology of biometrics for public policy matters involving security and privacy.

UNIT I [10 hours]

Introduction – Benefits of biometric security – Verification and identification – Basic working of biometric matching – Accuracy – False match rate – False non-match rate – Failure to enroll rate – Derived metrics – Layered biometric solutions.

UNIT II [10 hours]

Finger scan – Features – Components – Operation (Steps) – Competing finger Scan technologies – Strength and weakness. Types of algorithms used for interpretation. Voice Scan - Features – Components – Operation (Steps) – Competing voice Scan (facial) technologies – Strength and weakness.

UNIT III [10 hours]

Iris Scan - Features – Components – Operation (Steps) – Competing iris Scan technologies – Strength and weakness. Facial Scan - Features – Components – Operation (Steps) – Competing facial Scan technologies – Strength and weakness.

2. Biometric Systems Technology, Design and Performance Evaluation, James Wayman, Anil Jain, Davide Maltoni and Dario Maio, Springer Publications.
3. Personal Identification in Networked Society, Jain, A.K.; R Bolle, Ruud M.; S Pankanti, Sharath, 1st ed. 1999. 2nd printing, 2006, Springer Publications.
4. Handbook of Biometrics, Jain, Anil K.; Flynn, Patrick; Ross, Arun A, Springer, 2008.

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INTRODUCTION TO AUDIO & VIDEO PROCESSING

12ML7GE4AV

Course Objectives

The audio and video engineering course instructs students in the fundamentals of audio and video principles and techniques. Topics common to these audio engineering courses include the use of microphones, sound characteristics, acoustical principals and design objectives in audio projects. Students understand different Color Television Systems, Audio and Video coding, audio and Video compression techniques.

Course outcome

Students will gain knowledge of the latest in evolving theoretical and practical applications in the communication field utilizing various resources and methods of inquiry. Students will be knowledgeable of the latest in technology used in audio and video processing and its application in Communication Engineering.

UNIT I [12 hours]

Audio Engineering: Sound waves, Complex sounds, Audio frequency range, loudness, pitch, and decibels. Sound pick up devices (microphones): types: - condenser- carbon, piezoelectric – direction pattern-parameters ofmicrophones: - frequency range-sensitivity-impedance- noise. Sound reproduction devices: types: - horn, cone –typical specifications- Acoustics of speech production and hearing. Recording of Sound: Magnetic recordingsystems –optical storage systems-Coding and decoding applied to CD – CD-R.

UNIT II [10 hours]

Video Engineering: Elements of Television System:- Basic Block Schematic of Monochrome TV Transmitter and receiver, Gross structure, flicker& interlaced scanning ,number of scanning lines. Horizontal and Verticalresolution, Resolution and Bandwidth. Composite video signal- Vertical and horizontal synchronization,Vestigial Sideband Transmission, transmission of Sound signal. Modulation Positive and Negative Modulationand its comparison **-** Picture tubes. Television Cameras, Working Principle and operation of CCD cameras.

UNIT III **[12 hours]**

Colour Television: Compatibility considerations, Colour response of human eye, three colour theory, additivemixing of colours, chromaticity diagram, Luminance and chrominance, Block schematic explanation of ColourTV Cameras. Colour difference signal and its generation. Colour signal transmission, Modulation of colourDifference signals and colour burst signal. Basic Colour Television Systems: PAL, NTSC and SECAM.-BlockSchematic, explanation and Comparison. Colour TV picture tubes: CRTs, LCD and Plasma displays.

UNIT IV **[08 hours]**

Audio and Video coding: Introduction to Audio Coding, Audio compression, MPEG – Block diagram of audio encoder and decoder, Digital Audio Broadcasting- Block schematic explanation.

UNIT V **[10 hours]**

Video coding and compression: Need for compression- video image representation – quantization of image data. Intra frame compression techniques: DPCM–DCT based transform coding, Motion Compensation –H261 videoconference coding standard-MPEG video compression- HDTV- DVB-T

TEXT BOOK:

1. RR Gulati, Monochrome and Colour Television, New Asian Age
2. Fred Halsal , Multimedia Communications ,Pearson Education

REFERENCE BOOKS:

Thomas Quatieri , Discrete Time Speech Signal Processing: Principles and practice , Pearson Education

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WIRELESS COMMUNICATION

11EC7GE4WC *(Except TC)*

Objectives

- This course introduces the student to the concepts of cellular communication.
- To enable the students to understand the various modulation techniques, propagation methods, coding and multiple access techniques used in wireless communication.
- Study the second generation digital cellular networks in detail.

UNIT I **[08 hours]**

Introduction: Application and requirements of wireless services, History, types of services, requirements for services, Economical and social aspects. Spectrum limitations, limited energy, user mobility.

UNIT II **[12 hours]**

The Cellular concept: System design fundamentals: Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Trunking and Grade of service, Improving coverage and capacity in cellular system.

UNIT III **[12 hours]**

Mobile radio propagation: Large scale path loss – Introduction to Radio wave propagation, free space propagation model, relating power to electric field, Reflection, Ground Reflection model, Diffraction, Scattering.

Small scale fading- small-scale multipath propagation, Impulse response model of a multipath channel, small scale multipath measurements, Parameters of mobile multipath channels, Types of small scale fading.

UNIT IV **[10 hours]**

Equalization and Diversity: Fundamentals of Equalization, Training a Generic Adaptive Equalizer, Equalizers in communication receiver, Survey of Equalization Techniques, Linear and non-linear equalization, Algorithms for Adaptive Equalization, Fractionally

Spaced equalizers, Diversity techniques, RAKE receivers.

UNIT V **[10 hours]**

Global System for Mobile communication: System overview, The air interface, Logical and physical channels, synchronization, coding , circuit switched data transmission, Establishing a communication and handoff, Services and billing.

TEXT BOOKS:

1. **Wireless Communication- A**ndreas F Molish, Wiley Student, Second Edition (Units 1&5)
2. **Wireless Communication- Principles and Practice,** Theodre S Rappaport, Second Edition (Units 2, 3&4)

EMBEDDED SYSTEM DESIGN
11EC7GE4ES

Objectives

- Introduce to features that build an embedded system.
- To understand the interaction of the various components within embedded system and the techniques of interfacing between processors & peripheral device related to embedded processing.
- To understand the basic concepts of systems programming like operating system, assembler compliers etc and the management task needed for developing embedded system.

UNIT I **[10 hours]**

Introduction to Embedded System:
Introduction to functional building blocks of embedded systems – Register, memory devices, ports, timer, and interrupt controllers using circuit block diagram representation for each category.

UNIT II **[08 hours]**

Processor and Memory Organization: Structural units in a processor; selection of processor & memory devices; shared memory; DMA; interfacing processor, memory and I/O units; memory management – Cache mapping techniques, dynamic allocation - Fragmentation.

UNIT III **[10 hours]**

Devices & Buses for Devices Network: I/O devices, timer & counting devices; serial communication using I2C, CAN, USB buses; parallel communication using ISA, PCI, PCI/X buses, arm bus; interfacing with devices/ports, device drivers in a system – Serial port & parallel port.

UNIT IV **[12 hours]**

I/O Programming Schedule Mechanism: Intel I/O instruction – Transfer rate, latency; interrupt driven I/O - Non-maskable interrupts; software interrupts, writing interrupt service routine in C & assembly languages; preventing interrupt overrun; disability interrupts. Multi threaded programming – Context switching, premature & non-premature multitasking,semaphores.

Scheduling – Thread states, pending threads, context switching, round robin scheduling, priority based scheduling, assigning priorities, deadlock, watch dog timers.

UNIT V **[12 hours]**

Real Time Operating System (RTOS):

Introduction to basic concepts of RTOS, Basics of real time & embedded system operating systems, RTOS – Interrupt handling, task scheduling; embedded system design issues in system development process – Action plan, use of target system, emulator, use of software tools

TEXT BOOKS:

1. Rajkamal, **'Embedded System – Architecture, Programming,** Design', Tata McGraw Hill, 2003.

2. Daniel W. Lewis **'Fundamentals of Embedded Software',** Prentice Hall of India, 2004.

REFERENCE BOOK:

1 David E. Simon**, 'An Embedded Software Primer',** Pearson Education, 2004.

2 Frank Vahid **'Embedded System Design – A Unified hardware & Software Introduction'** John Wiley, 2002.

3 Sriram V. Iyer, Pankaj Gupte, **'Embedded Real Time Systems Programming',** Tata McGrawHill,2004.

4 Steve Heath, **'Embedded System Design', II edition,** Elsevier**, 2003**

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DISTRIBUTED COMPUTING

11IT7GE4DC

Objectives:

This course is designed to provide clear understanding of fundamental concept and design principles that underlie a distributed computing system.

UNIT I **[10 hours]**

INTRODUCTION:

Scope, goals, motivation, historical development, architectural models, design issues.

NETWORKS & PROTOCOLS:

Computer network principles, local network technologies, protocols for distributed systems, asynchronous transfer mode network.

UNIT II **[10 hours]**

REMOTE PROCEDURE CALLING:

Introduction, characteristics of remote procedure calling, interface definitions, binding, the RPC software, and implementation of RPC with lightweight process.

UNIT III **[11 hours]**

SYNCHRONIZATION IN DISTRIBUTED SYSTEMS:

Clock synchronization, mutual exclusion, election Algorithm, dead lock in distributed systems.

PROCESS AND PROCESSOR IN DISTRIBUTED SYSTEMS:

Threads, processor allocation, scheduling.

UNIT IV **[11 hours]**

DISTRIBUTED DATABASES:

Division of responsibilities, file service, access control, directory service, and implementation.

STRUCTURED DISTRIBUTED DATABASES: Overview of client server, architecture, data fragmentation, replication and allocation techniques over processing.

UNIT V **[10 hours]**

CASE STUDY:

Introduction, locus, sun network file system, Cambridge file server, Ameba, mach, Apollo domain.

TEXT BOOKS:

1. **"Modern Operating Systems ",** A S Tanenbaum PHI 1996
2. **"Distributed systems, concepts and design ",** George F Coulounis & Jeon dollimose

REFERENCE BOOK:

1. **"Distributed computing systems, synchronization, control and communication ",** Parkar & Venis J P; Academic press 1983
2. **"Distributed data base principles and systems",** Ceri S & Pelagatt, Mc-Graw Hill 1984
3. **"Distributed operating systems",** Pradeep K Sinha --PHI 1998.

MEDICAL IMAGING SYSTEMS
11IT7GE4MI (EXCEPT ML)

Objective:

The course focuses in the area of Therauptic instruments . The evolution of ultrasonic medical imaging, computerized tomography & NMR Scanners are introduced in the syllabus to provide an inner depth to theses diagnostic equipments / instruments .

*development of prototype

*Applying this knowledge in the design of smart sensors with portable equipment.

UNIT I **[10 hours]**

X-RAYS: Interaction between X-Rays and matter, Intensity of an X-Ray, Attenuation, X-Ray Generation and Generators, Beam Restrictors and Grids, Intensifying screens, fluorescent screens and Image intensifiers.

UNIT II **[09 hours]**

COMPUTED TOMOGRAPHY: Conventional tomography, Computed tomography principle, Projection function Generations of CT machines, Electron beam CT, Reconstruction algorithms, Helical CT.

UNIT III **[09 hours]**

ULTRASOUND IMAGING: Acoustic propagation, Attenuation, Absorption and Scattering,Ultrasonic transducers, Arrays, A mode, B mode, M mode scanners, Tissue characterization, Color Doppler flow imaging.

UNIT IV **[11 hours]**

MAGNETIC RESONANCE IMAGING: Angular momentum, Magnetic dipole moment, Magnetization, Larmor frequency, Rotating frame of reference, Free induction decay, Relaxation times, Pulse sequences. Introduction to functional MRI.

UNIT V **[13 hours]**

THERMAL IMAGING: Medical thermography, Infrared detectors, Thermographic equipment, Pyroelectric vidicon camera.

RADIONUCLIDE IMAGING: Interaction of nuclear particles and matter, Nuclear sources, Radionuclide generators, Nuclear radiation detectors, Rectilinear scanner, scintillation camera, SPECT, PET.

TEXT BOOKS:

1. Principles of Medical Imaging- Kirk shung, Academic Press.

2. Handbook of Biomedical Instrumentation- Khandpur, Tata McGraw-Hill Publishing Company Ltd., 2nd Edition, 2003.

REFERENCE BOOK:

1, Medical Imaging Signals and Systems- Jerry L Prince and Jonathan M Links, Prenti Hall of India/Pearson Education.

2. Fundamentals of medical Imaging- Zhong Hicho and Manbir singh, John Wiley.

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ELECTRICAL POWER QUALITY

12EE7GE5PQ

UNIT I **[09 hours]**

Introduction to Power Quality; Definition Of Power Quality; Causes Of Disturbances In Power Systems; Need For Power Quality, Power Quality Evaluation Procedure.

UNIT II **[09 hours]**

Classification Of Power Quality Issues; Transients, Short Duration Voltage Variations, Long Duration Voltage Variations, Voltage Imbalance, Waveform Distortions, Voltage Fluctuations And Flicker, Power Frequency Variations.

UNIT III **[12 hours]**

Measures used for power quality; harmonics, average value of non sinusoidal waveform, RMS value of non sinusoidal waveform, form factor(FF), ripple factor(RF), harmonic factor(HF), lowest order harmonic(LOH), total harmonic distortion(THD), total inter harmonic distortion (TIHD), total sub harmonic distortion(TSHD), total demand distortion (TDD), distortion power (D).

UNIT IV **[10 hours]**

Power Quality Measurement Equipment; Types Of Instruments, Wiring And Grounding Testers, Multi-Meters, Digital Cameras, Oscilloscopes, Disturbance Analyzers, Spectrum Analyzers And Harmonic Analyzers, Flicker Meters, Smart Power Quality Meters, Transducer Requirements.

UNIT V **[12 hours]**

Overview Of Mitigation Methods; From Fault To Trip, Reducing The Number Of Faults, Reducing The Fault-Clearing Time, Changing The Power System, Installing Mitigation Equipment , Improving Equipment Immunity, Different Events And Mitigation Methods, Summary and future direction.

TEXT BOOKS:

1) Power quality in power systems and electrical machines- Ewald F Fuchs: Mohammad A S Masoum; First Indian Reprint 2009, Indian reprint ISBN: 978-81-312-2350-5; Academic Press-An imprint of Elsevier
2) Electrical power systems quality, Second Edition, Roger, C Dugan/Mark F McGranaghan/Surya Santosa/H Wayne Beaty; Tata McGraw Hill Edition.

REFERENCE BOOK:

Understanding Power quality problem: voltage fags and interruptions by Mat H Bollen, First Edition, IEEE Press

SWITCH MODE POWER SUPPLIES
11EE7GE5SP

UNIT I [10 hours]

INTRODUCTION TO DC-DC SWITCHED MODE CONVERTERS: Basic Topologies, Buck, boost, buck-boost, and Cuk converters.

UNIT II [08 hours]

FULL BRIDGE DC-DC CONVERTER: Detailed theory, working principles, modes of operation, with detailed circuits and wave forms, applications, merits and demerits (Operation of the above converters is CCM mode only)

UNIT III [10 hours]

DC-AC SWITCHED MODE INVERTERS: Single-phase inverter, three phase inverters. SPWM inverter, detailed theory, working principles, modes of operation with circuit analysis, applications, merits and demerits, problems based on input output voltage relationship.

UNIT IV **[14 hours]**

RESONANT CONVERTERS: Zero voltage and zero current switching, resonant switch converters, and comparison with hard switching, switching locus diagrams, and working principle.

HIGH FREQUENCY INDUCTOR AND TRANSFORMERS: Design principles, definitions, comparison with conventional design and problems.(Examples of Inductor and Transformer design for forward and flyback converter)

UNIT V **[10 hours]**

POWER SUPPLIES: Introduction, DC power supplies: fly back converter, forward converter, push-pull converter, half bridge converter, full bridge converter, AC power supplies: switched mode ac power supplies, resonant ac power supplies, bidirectional ac power supplies.

TEXT BOOKS:

1. **Power Electronics-** converters, application & design- Mohan N, Undeland T.M., Robins, W.P-John Wiley 1989
2. **Power Electronics-Circuits, Devices**, Applications- Rashid M.H.-3rd Edition, Prentice Hall India, 2008.
3. **Power Electronics and A.C. Drives-** Bose B.K.-Prentice Hail 1986.
4. **Digital Power Electronics And Applications-** Muhammad Rashid. first edition, 2005, Elsevier

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EMC –EMI

11TC7GE5EM

Objective:

- ability to apply the knowledge of EMC/EMI to examples
- ability to apply the knowledge of electromagnetics and measurements to instruments
- ability to apply the knowledge of EMC standards and regulations
- ability to apply the knowledge of EMI control methods
- ability to design PCB considering trace routing, impedance control, decoupling, zoning and grounding

UNIT I **[11 hours]**

BASIC CONCEPTS:

Definition of EMC, EMI with examples, SMPS, UPS, Classification of EMC/EMI-CE,RE,CS,RS, Units of parameters, Sources of EMI, EMI coupling modes-CM,DM,ESD phenomena and effects, Transient phenomena and suppression

UNIT II **[11 hours]**

EMI MEASUREMENTS :

Basic principles of RE,CE, RS, CS measurements, EMI measuring instruments-Antennas, LISN, feed through capacitor, current probe, EMC analyzer, and detection technique, open area site, shielded anechoic chamber, TEM cell

UNIT III **[10 hours]**

EMC STANDARD AND REGULATIONS: National and international standardizing organizations,-FCC, CE, and RE standards, frequency assignment-spectrum conversation

UNIT IV **[10 hours]**

EMI CONTROL METHODS AND FIXES:

Shielding, grounding, bonding, filtering, EMI gasket, isolation transformer, optical isolator

UNIT V **[10 hours]**

EMC DESIGN AND INTERCONNECTION TECHNIQUES:

Cable routing and connection, component selection and mounting, PCB design-Trace uting, impedance control, decoupling, zoning and grounding

TEXT BOOK:

1. Prasad Kodali.V - Engineering Electromagnetic Compatibility - S.Chand&Co - New Delhi - 2000
2. Clayton R.Paul - Introduction to Electromagnetic compatibility - Wiley & Sons - 1992

REFERENCE BOOKS:

1. Keiser - Principles of Electromagnetic Compatibility - Artech House - 3rd Edition - 1994
2. Donwhite Consultant Incorporate - Handbook of EMI / EMC - Vol I - 1985

SATELLITE COMMUNICATION
11TC7GE5SC

Objective:

- ability to apply the knowledge of Kepler's laws to satellite orbits
- ability to apply the knowledge of communication and control in satellite subsystems
- ability to design communication modules considering power, bandwidth, cost, environment and safety
- ability to identify, formulate and solve problems in satellite link

UNIT I **[11 hours]**

OVER VIEW OF SATELLITE SYSTEMS: Introduction, frequency allocation, INTEL Sat, India in space. ORBITS: Kepler laws, orbital elements, orbit perturbations, inclined orbits, calendars, orbital plane and sun synchronous orbits, Geostationary orbit: antenna look angles, limits of visibility, earth eclipse of satellite, sun transit outage, launching orbits

UNIT II **[11 hours]**

PROPAGATION IMPAIRMENTS AND SPACE LINK: Introduction, atmospheric loss, ionospheric effects, rain attenuation, other impairments.
SPACE LINK: Introduction, EIRP, transmission losses, link power budget, system noise, CNR, uplink, down link, effects of rain, combined CNR

UNIT III **[10 hours]**

SPACE SEGMENT: Introduction, Power supply units, Attitude control, Station keeping, Thermal control, Telemetry tracking and command, Transponders, Antenna subsystem

UNIT IV **[10 hours]**

SATELLITE ACCESS: Pre-assigned FDMA, SCPC (spade system), TDMA, pre-assigned TDMA, demand assigned TDMA, down link analysis, comparison of uplink power requirements for TDMA & FDMA, On board signal processing, satellite switched TDMA.

UNIT V **[10 hours]**

SATELLITE SERVICES: DBS, orbital spacing, power ratio, frequency and polarization, transponder capacity, bit rates for digital TV, satellite mobile services, VSAT, RadarSat, GPS, orbcomm

TEXT BOOK:

Satellite Communications, Dennis Roddy, 4th Edition, McGraw-Hill International edition, 2006.

REFERENCE BOOKS:

1. **Satellite Communications**, Timothy Pratt, Charles Bostian and Jeremy Allnutt, 2nd Edition, John Wiley & Sons, 2003.
2. **Satellite Communication Systems Engineering,** W. L. Pitchand, H. L. Suyderhoud, R. A. Nelson, 2nd Ed., Pearson Education., 2007.
3. **Satellite Communication Systems Engineering-**Louis J. Ippolito Jr, Wiley Publishers.

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ASIC DESIGN

11ES7GE5AD

Objective: The course deals with the study of the hardware structure, synthesis methods, design methodology and design flow from the application to ASIC chip.

UNIT I **[10 hours]**

Introduction: Full Custom with ASIC, Semi custom ASICS, Standard Cell based ASIC, Gate array based ASIC, Channeled gate array, Channel less gate array, structured get array, Programmable logic device, FPGA design flow, ASIC cell libraries

UNIT II **[10 hours]**

Data Logic Cells: Data Path Elements, Adders, Multiplier, Arithmetic Operator, I/O cell, Cell Compilers

ASIC Library Design: Logical effort: practicing delay, logical area and logical efficiency logical paths, multi stage cells, optimum delay, optimum no. of stages, library cell design.

UNIT III **[11 hours]**

Low-level Design Entry: Schematic Entry: Hierarchical design. The cell library, Names, Schematic, Icons & Symbols, Nets, schematic entry for ASIC.S, connections, vectored instances and buses, Edit in place attributes, Netlist, screener, Back annotation

ASIC Construction

UNIT IV **[11 hours]**

Floor Planning : Physical Design, CAD Tools, System Partitioning, Estimating ASIC size, partitioning methods. Floor planning tools, I/O and power planning, clock planning,

UNIT V **[10 hours]**

Placement and Routing placement algorithms, iterative placement improvement, Time driven placement methods. Physical Design flow global Routing, Local Routing, Detail Routing, Special Routing, Circuit Extraction and DRC.

TEXT BOOK:

M.J.S .Smith, **- "Application - Specific Integrated Circuits" –** Pearson Education, 2003

REFERENCE BOOKS:

1. Jose E.France, Yannis Tsividis, **"Design of Analog-Digital VLSI Circuits for Telecommunication and Signal Processing",** Prentice Hall, 1994.
2. Malcolm R.Haskard; Lan. C. May, **"Analog VLSI Design - NMOS and CMOS"** Prentice Hall, 1998.
3. Mohammed Ismail and Terri Fiez**, "Analog VLSI Signal and Information Processing",** McGraw Hill, 1994.

ADVANCED MEDICAL IMAGE PROCESSING
11ML7GE5IP

Objective:

The Subject aims to introduce advanced concepts and methodologies for digital image processing and implementing the various techniques of image processing to make the results (output images) more suitable than the original Bio-medical images.

UNIT I [12 hours]

MORPHOLOGICAL IMAGE PROCESSING: Preliminaries, Erosion, Dilation, Duality, Opening and Closing, The Hit-or-Miss Transformation, Some Basic Morphological Algorithms, Boundary Extraction, Hole Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening, Skeletons, Pruning, Morphological Reconstruction, Summary of Morphological Operations of Binary Images, Gray-Scale Morphology, Erosion and Dilation, Opening and Closing, Some Basic Gray-Scale Morphological Algorithms, Gray-Scale Morphological Reconstruction.

UNIT II **[08 hours]**

IMAGE SEGMENTATION: Fundamentals, Point, Line, and Edge Detection, Background, Detection of Isolated Points, Line Detection, Edge Models, Basic Edge Detection, More Advanced Techniques for Edge Detection, Edge Linking and Boundary Detection, Thresholding**,** Foundation, Basic Global Thresholding, Optimum Global Thresholding Using Otsu's Method, Using Image Smoothing to improve Global Thresholding, Using Edges to improve Global Thresholding, Multiple Thresholds, Variable Thresholding, Multivariable Thresholding, Region-Based Segmentation, Region Growing, Region Splitting and Merging, Segmentation Using Morphological watersheds, Background, Dam Construction, watershed segmentation Algorithm, The Use of Markers, The Use of Motion in Segmentation, Spatial Techniques, Frequency Domain Techniques.

UNIT III **[10 hours]**

REPRESENTATION AND DESCRIPTION: Representation, Boundary (Border) Following, Chain Codes, Polygonal Approximations Using Minimum-Perimeter Polygons, Other Polygonal Approximation Approaches, Signatures, Boundary Segments, Skeletons, Boundary Descriptors, Shape Numbers, Fourier Descriptors, Statistical Moments, Regional Descriptors, Some Simple Descriptors, Topological Descriptors, Texture, Moment Invariants, Use of Principal Components for Description Relational Descriptors.

UNIT IV **[10 hours]**

OBJECT RECOGNITION: Patterns and Pattern Classes, Recognition Based on Decision-Theoretic Methods, Matching, Optimum Statistical Classifiers, Neural Networks, Structural Methods, Matching Shape Numbers, String Matching.

UNIT V **[12 hours]**

WAVELETS AND MULTIRESOLUTION PROCESSING: Image Pyramids, Sub band Coding, The Haar Transform, Multi resolution Expansions, Series Expansions, Scaling Functions, Wavelet Functions, Wavelet Transforms in One Dimension, The Wavelet Series Expansions, The Discrete Wavelet Transform, The Continuous Wavelet Transform. The Fast Wavelet Transform. Wavelet Transforms in Two Dimensions. Wavelet Packets

TEXT BOOK:

Digital Image Processing by RafaelC. Gonzalez & Richard E. Woods, Third Edition. Pearson Education Inc.

REFERENCE BOOKS:

1. **Digital Image Processing using MATLAB** by RafaelC. Gonzalez & Richard E. Woods, Second Edition.Pearson Education Inc.
2. **Image Processing, Analysis andMachine-Vision** by Milan Sonka,Vaclav Hlavac& Roger Boyle, Second Edition
3. **Digital Image Processing** by S Jayakumaran, S Esakkirajan, T Veerakumar, Tata McGraw Hill Education Private Ltd.

ADVANCED BIOMEDICAL DIGITAL SIGNAL PROCESSING
11ML7GE5SP

Objectives:

Understand the concepts of Discrete and continuous Random Variables, Probability Density Function and its types. To be able to understand the various measurement parameters based on signal processing concepts. Such as power spectral analysis on ECG,EMG,EEG signals.

UNIT I **[10 hours]**

INTRODUCTION: Discrete and continuous Random variables, Probability distribution and density functions. Gaussian and Raleigh density functions, Correlation between random variables.

Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth, noise figure of systems.

UNIT II **[10 hours]**

TIME SERIES ANALYSIS: Introduction to time series analysis, AR, MA and ARMA models, Parameter estimation of ARMA models (Maximum likelihood method), Process order estimation, Adaptive segmentation, autocorrelation measure (ACM) method, spectral error measure(SEM) method.

UNIT III **[08 hours]**

SPECTRAL ANALYSIS: Introduction to spectral analysis, the PSD, Cross – Spectral Density and coherence functions, Linear filtering, the Wiener filter, Cepstral analysis. Homomorphic filtering

UNIT IV **[12 hours]**

SPECTRAL ESTIMATION: Introduction, estimation based on Fourier transform, the expected value of the Periodogram, weighted overlapped segment averaging (WOSA), smoothing of the Periodogram, estimation based on Maximum entropy method (MEM) and the AR method, the Moving average (MA) method, Autoregressive moving average (ARMA) methods, Prony's method, Maximum likely hood method (MLM), comparison of several methods.

UNIT V **[12 hours]**

WAVELETS: Introduction to Wavelets: Multi resolution, Formulation of Wavelet systems, The Scaling Functions, and scaling Coefficients, Wavelet and Wavelet Coefficients, Calculation of the Discrete Wavelet Transform, Wavelet-Based Signal Processing and Applications.

TEXT BOOKS:

1. Biomedical Signal Processing: Time & Frequency Analysis (Vol-1) by Arnon Cohen., CRC Press, 1986.
2. Introduction to Wavelets and Wavelet Transforms, Burrus, Gopinath and Gao, Prentice Hall, 1998.

REFERENCE BOOKS:

1. Biomedical Signal Analysis by Rangaraj M. Rangayyan –. IEEE Press, 2001.
2. Biomedical Signal Processing by MatinAkay, Academic, Press 1994
3. Wavelet Transforms by Raghuveer M. Rao and Ajit S. Bopardikar, Pearson, 1998.

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NETWORK SECURITY
11EC7GE5NS

Objective

This course focuses on communication security in computer systems and networks and aims at providing students with a comprehensive introduction to the field of network security and services that are most essential for secure communication over the net.

UNIT I **[12 hours]**

Services, Mechanisms and Attacks, The OSI security Architecture, A model for network security. Symmetric Ciphers: Symmetric Cipher model, Substitution techniques, Transposition technique, Simplified DES, Data encryption Standard, The strength of DES, Differential and linear cryptanalysis, Block cipher design principles and modes of operation.

UNIT II **[10 hours]**

Introduction to finite fields- Groups ,rings and fields, modular arithmetic, Euclid'S Algorithm, Finite fields of the form GF(p), Polynomial arithmetic, Finite Fields of the form GF(2n). Prime numbers, Fermat's and Euler's Theorems, Testing for primarily, the Chinese Remainder Theorem, and Discrete logarithms.

UNIT III **[10 hours]**

Principles of Public key cryptosystems, The RSA algorithm, Key Management, Diffe-Hellman Key exchange, Elliptic Curve Arithmetic, Authentication functions, Digital signatures, Digital signature standard.

UNIT IV **[10 hours]**

Electronic Mail Security- Pretty Good Privacy, S/MIME Web security- Secure Electronic Transaction.

UNIT V **[10 hours]**

Intruders, Intruder detection, Password management, Viruses and related threats.

Firewalls Design Principles, Trusted systems.

TEXT BOOK:

1. **Cryptography and Network Security-**Principles and Practice: William Stallings, Third Edition.

REFERENCE BOOKS:

1. **Fundamentals of Network Security**-Eric Maiwald, 2009 Edition, Information Security Series
2. **Network Security-Private Communication in a public World:**Charlie Kaufman, Radia Perlman, Mike Speciner, Second Edition

LOW POWER VLSI DESIGN
11EC7GE5LP

Objectives

Low Power technology is the most needed technology of modern electronics. This course enables the student to understand the design challenges of low power techniques and its impact on low power technology.

UNIT I **[08 hours]**

Introduction to Low power CMOS design: Need for Low Power VLSI chips, charging and discharging capacitance, Short circuit current in CMOS circuit, CMOS leakage current, Static current, Basic Principles of low power design, Low power figure of merit.

UNIT II **[12 hours]**

Power Analysis: Simulation Power Analysis: Spice circuit simulation, Discrete transistor modeling, Gate level logic simulation, architecture level analysis, Monte-Carlo simulation, Probabilistic Power analysis: Random Logic signals, Probability and frequency, Probabilistic power analysis techniques, Signal entropy.

UNIT III **[10 hours]**

Low power circuit techniques: Power consumption in circuits, Flip-flops and latches, logic, high capacitance nodes.

UNIT IV **[10 hours]**

Energy recovery in CMOS: A look at practical details, retractile logic, reversible pipelines, High performance approaches.

UNIT V **[12 hours]**

Clock distribution and logic synthesis for low power: Low power Clock distribution: Power dissipation in clock distribution, single driver Vs distributed buffers, Process variations in buffer and device sizing, Low power logic synthesis: Power estimation techniques, power minimization techniques.

TEXT BOOKS:

1. **Practical Low Power Digital VLSI design,** Gary Yeap, Kluwer academic publishers, 1998.
2. **Low Power design Methodologies ,** Jan M Rabaey, Massoud Pedram, Kluwer academic publishers, 2002.

REFERENCE BOOK:

1. Low Power CMOS VLSI circuit design, Kaushik Roy, Sharat C Prasad, Wiley Interscience publication, 2000.

2. Low Power Design in deep submicron Electronics, W. Nebel, J. Mermet, Kluwer academic publishers, 1997.

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EMBEDDED SYSTEM & RTOS

11IT7GE5ES

UNIT I **[10 hours]**

INTRODUCTION: An Embedded System; Characteristics of Embedded Systems; Software embedded into a system; Real Time Definitions, Events and Determinism, Synchronous & Asynchronous Events, Determinism, Sequence Control, Loop control, Supervisory control, Centralized computer control, Hierarchical and Distributed system, Human-computer interface, Benefits of computer control systems.

UNIT II **[10 hours]**

OPERATING SYSTEMS: Introduction, Real-time multi-tasking OS, Scheduling strategies, Priority Structures, Task management, Scheduler and real-time clock interrupt handles, Memory Management, Code sharing, Resource control, Task co-operation and communication, Mutual exclusion, Data transfer, Liveness, Minimum OS kernel, Examples.

UNIT III **[12 hours]**

REAL TIME SPECIFICATIONS AND DESIGN TECHNIQUE: Mathematical specifications, flow charts, structure charts, Finite state automata, data flow diagrams, Petri Nets, Warnier Orr Notation, State charts.

PROCESSOR AND MEMORY ORGANIZATION: Structural Units in a Processor; Memory Devices, Memory selection for an embedded system; Direct Memory Access, DMA controllers; Interfacing Processor, Memory and I/O Devices.

UNIT IV **[10 hours]**

INTERRUPT SERVICING (HANDLING) MECHANISM: Context and the periods for context switching; Deadline and interrupt latency. Language Features: Parameter passing, Recursion, Dynamic allocation, Typing, exception handling, abstract data typing.

REAL TIME KERNELS: Real Time and Embedded Operating Systems; Interrupt Routines in RTOS environment; co routines, Interrupt driven systems, Foreground/background systems, Full-featured Real Time Operating Systems.

UNIT V **[10 hours]**

INTER-PROCESS COMMUNICATION AND SYNCHRONIZATION OF PROCESSES: Multiple processes in an application; Problem of sharing data by multiple tasks and routines; Inter Process Communication, Mailboxes, Critical Regions, Semaphores, Deadlock.

PROGRAMMING LANGUAGES AND TOOLS: DESIRED LANGUAGE CHARACTERISTICS: Data typing; Control Structures; Packages; Exception Handling; Overloading; Multitasking; Task Scheduling; Timing specification; Programming environments; Runtime support.

Lab Experiments will be conducted using low power Microcontroller MSP 430

TEXT BOOKS:

1. **Embedded Systems Architecture; Programming and Design-**Rajkamal; Tata McGraw Hill Publications.
2. **Real–Time Systems Design and Analysis––**3rd Edition, Phillip A. Laplante. Apr 2004. Wiley-IEEE Press.
3. **Real - Time Computer Control- An Introduction – S**tuart Bennet,, 2nd Edn. Pearson Education. 2005.

REFERENCE BOOKS:

1. **Real Time Systems-** C.M. Krishna, Kang G.Shin McGraw-Hill, 1997.
2. **An Embedded software primer-David E** Simon; Addison Wesley; 2000.
3. **An Introduction to Real Time Systems-**Raymond J.A. Buhr; Donald L. Bailey; Prentice Hall International; 1999.
4. **Embedded Real Time system-**Concepts, Design and Programming, Dr. K. V. K. K. Prasad Dream Tech Pres, New Delhi 2003.

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COMPUTER COMMUNICATION NETWORKS
11IT7GE5CN (Except TC, EC)

Objective:

- To understand the state-of-the-art in network protocols, architectures, and applications.
- To understand network functional components and their interaction.

UNIT I [10 hours]

INTRODUCTION: Uses of computer networks, Data communication, Circuit Switching, Packet Switching, Network Models, Example Networks, Network standardization. Theoretical basics of data communication, Layered tasks, OSI Model, Layers in OSI model, Functions, TCP/IP Suite, Addressing.

UNIT II [12 hours]

DATA LINK CONTROL: Framing, Flow and error control, Protocols, Noiseless channels: Simplest protocol, Stop and wait protocol, Noisy channels: Stop and wait protocol ARQ, piggy backing, Go-Back-N ARQ, sliding window protocol, Selective repeat ARQ, HDLC, Point to point protocol.

Multiple accesses control: Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA, **Controlled access**: Reservation, Polling, and Token passing

UNIT III [10 hours]

MEDIUM ACCESS SUB LAYER:

Static and dynamic channel allocation, multiple access protocols, LAN/MAN technology, Bus/Tree, Star and Ring topologies, The ring topology, Medium access control protocols, MAC performance, LAN/MAN standards, IEEE 802.2, 802.3, 802.4, IEEE802.5, 802.6, 802.11, and 802.16, Blue tooth

UNIT IV [10 hours]

NETWORK LAYER: Unicast Routing Protocols, Multicast Routing protocols, Logical addressing, Ipv4, Ipv6 format & addressing, Transition from Ipv4 to Ipv6, Delivery, Forwarding,

UNIT V **[10 hours]**

TRANSPORT LAYER: Transport layer Process to process Delivery, UDP, TCP, SCTP, Congestion, Congestion Control, Examples, QOS, and Techniques to improve QOS.

APPLICATION LAYER: Client Server Model, Domain Name Space (DNS), Electronic mail, HTTP, World Wide Web (WWW)

TEXT BOOK:

1. Data communication and networking– Behrouz A. Forouzan, 4th Ed, TMH 2006.
2. William Stallings, Data and Computer Communications, Fifth edition, PHI, 1998.
3. Computer networks – Andrew. S. Tannenbaum

REFERENCE BOOKS:

1. Data communication and networking– Behrouz A. Forouzan, 3rd Ed, TMH 2006